SAMUEL MAYNARD
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THE READY OBSERVATOR;

OR

An Infallible METHOD for Determining

THE

LATITUDE AT SEA:

By ALTITUDES of the SUN,

At any Time of the DAY, either Fore-noon or After-noon,

Independant of a MERIDIONAL OBSERVATION.

The Whole rendered peculiarly easy for Practice, and annexed with
a compleat and correct Sett of all the neceſsary

TABLES;

BY

N. D. FALCK, M.D.

The Second Edition, with an
APPENDIX.

London:

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on Tower Hill.

1778.

BRITISH MUSEUM

TO

LORD HAWKE, K. B.

Vice-Admiral of GREAT-BRITAIN,

Admiral of the Fleet, and an Elder-Brother of the Trinity-Houſe.

MY LORD,

YOUR Lordſhip's diſtinguiſhed Merits, which will for ever be deemed the great Pride of Seamen, the Boaſt of the Britiſh Nation, and the Ornament of human Nature, induces me moſt humbly to ſolicit your Lordſhip's Countenance to the READY OBSERVATOR.

IT will not only ſtamp ſo high a Value on this Work, as always to awaken the Attention of every Navigator, to reap the Benefit intended; but, it will confer an Honour on the Author, that will extend with him far beyond the Grave.

I have the Honour to be,

With the higheſt Eſteem and greateſt Reſpect,

MY LORD,

Your Lordſhip's moſt obedient

And moſt humble Servant,

February 25th,
1779.

N. D. FALCK.

PREFACE.

THE Importance of a practical and eaſy Method for determining the Latitude at Sea, independent of a Meridian Altitude, muſt be obvious to every judicious Seaman. They daily experience, that when the Latitude is moſt wanted, as in the Winter Seaſon, after a hard Gale, or approaching near the Land, then a Meridian Sun is very uncertain: And they are too often ſenſible of the Anxiety, that a Diſappointment of not knowing their Reckoning (on which frequently their All *depends) muſt naturally occaſion.*

This premiſed, will ſufficiently account for my Motive of offering to their Service this Work, appropriated for the abovementioned Uſe; a Thing which has long been wanted, conſequently wiſhed for by every Navigator: And therefore, I hope it will be received with univerſal Satisfaction.

I claim however no Merit as to its firſt Invention: This is due to Mr. Cornelius Douwes, *a Mathematician of* Amſterdam. *Next to him, we are indebted to* Mr. Richard Harriſon, *of* Whitehaven, *who having obtained it, together with the* Logarithmic Solar Tables, *in Manuſcript, from an Hollander, firſt publiſhed them in England, then known by the Name of* Harriſon's Solar Tables.

When that Pamphlet firſt appeared in Public, it was eagerly bought up by almoſt every Navigator that heard of it: All promiſed to themſelves great Satisfaction, but very few reaped the Benefit deſigned by it: As moſt of the Tables requiſite for the Operation were wanting, viz. *the* Sun's Declination, Natural

Natural Sines, Secants leſs Radius, *and* Common Logarithms. *The whole therefore became ſo prolix, tedious, and liable to Errors, that it ſoon was laid aſide as uſeleſs to the generality of Seamen.*

As an original Publication, it merited all the Applauſe which it then met with; but why it was not farther compleated, can ſcarce be made a Queſtion, without Reproof to thoſe who value themſelves in being uſeful to Navigation; ſince it is evident, from the repeated ſucceſsful Trials, that Seamen of all Ranks muſt have wanted it, as a Book abſolutely neceſſary at Sea. Theſe Conſiderations induced me to complete that Work, with all the requiſite Tables, and to render the Rules and Examples more eaſy and familiar to the practical Navigator.

The whole was ready for the Preſs, at New-York, *in the Year* 1766; *but the Multiplicity of Figures, rendered it at that Time too great an Undertaking for the Printing-houſes there.*

At my Arrival in London, *I was for ſome Time otherwiſe engaged; but finding no one had yet undertaken the laborious Taſk, (nay, the Problem itſelf lay neglected,) I could refrain no longer, but printed ſeveral Thouſands at my own Expence, in the Year* 1771; *and am happy to find the Book has given Satisfaction to the practical Navigator in all Latitudes, agreeable to my moſt ſanguine Expectation.*

The order of the Tables is new, and different from the common Method—but I flatter myſelf, they will always be approved as the eaſieſt for Inſpection, and the leaſt ſubject to Miſtakes.

In regard to my Directions, I have ſtudied to make them Conciſe, Regular and Plain; and in the Examples, I have given the moſt material Varieties that generally occur: I might have given many more; but thought it unneceſſary, as there are Opportunities enough at Sea to make a Variety of Experiments.

I have

I have omitted aſtronomical Proofs, as needleſs in Practice. The Problem is an Approximation; and a Meridian Obſervation, when Opportunity offers, will beſt prove the Truth of the Method.

Notwithſtanding the Pains and Expence I was at in printing the firſt Edition, both neat and correct, yet a few Errors would creep in, a Thing almoſt unavoidable in the printing from Manuſcript, conſidering the new Order of the Tables, and the Multiplicity of Figures: theſe Errors however few and inſignificant as they were, are carefully corrected in this ſecond Edition, and I ſhall hope the Tables are now as neat and correct as any extant: ſo that the Obſerver may ſecurely depend upon them, and conſequently his Calculation.

To render the Book ſtill more complete, I have added an Appendix, containing a conciſe, diſintereſted, and plain Deſcription of the Principles and Uſe of a plain Hadley's *Quadrant, and how to apply it in real Practice for taking a correct Altitude. Such a Deſcription I apprehend Seamen have long ſtood in Need of. — The Inſtrument itſelf is the nobleſt of it's Kind; but too frequently, Obſervers are miſled into groſs Errors with reſpect to the real Uſe of it at Sea.—Perſuaded my Obſervations will be found true in Practice, I recommend it to the ſerious Peruſal of the unprejudiced Navigator.*

I have nothing farther to add, than having myſelf formerly experienced the Perils of the fluctuating Ocean, I am the readier to ſerve a Set of Men whom I conſider as very valuable Members of the Community; and heartily wiſh them all the Benefit and Succeſs, which my beſt Endeavours to render this Work uſeful have intended.

N. D. FALCK.

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READY OBSERVATOR.

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AN

EXPLANATION

OF THE

TABLES.

BEFORE I proceed to the Inſtructions and Rules for the Operation, I think it requiſite, firſt to give an Explanation of the Tables, in order hat the whole may be underſtood and reduced to Practice, in a plain and amiliar Manner.

The Tables are placed in the following Order:

I.

OGARITHMIC SOLAR TABLES, of HALF ELAPSED TIME, MIDDLE TIME, and RISING; for Six Hours, to every Minute and half Minute.

II.

A TABLE of the SUN's DECLINATION.

III.

Table of NATURAL SINES, and SECANTS LESS RADIUS; to every Minute of the Quadrant.

IV.

A Table of COMMON LOGARITHMS; from 1 to 10,000.

THESE Tables are neatly divided by Longitudinal Lines to diſtinguiſh the olumns, and by Tranſverſe Lines at every 6th Line in the firſt three Tables, d at every 5th in the Logarithm, to direct the Eye. Immediately under ch of theſe Tranſverſe Lines, are the Figures of the Number at full Length; t in the reſt following downwards, abbreviated of the firſt two Figures, til they alter. By this Method the Tables are rendered more diſtinct, the e will readier find the Number looked for, and the Inſpector is not ſo liable Miſtakes, as in the ordinary Method.

I. THE LOGARITHMIC SOLAR TABLES are contained in 6 Pages; each Page Hour; which is ſpecified at the Top; thus: H. O. ſignifies to the firſt Hour, I. from 1 to the ſecond Hour, H. II. from the ſecond to the third, &c.

Each Page is alſo divided in the Middle by a triple Line; and each Diviſion in 5 Columns. M. ſtands for Minutes, S. for Seconds, H. E. T. for Half Elapſed Time, M. T. for Middle Time, and R. for Riſing.

II. The Table of the Sun's Declination is contained in 4 Pages, (viz.) firſt after Leap Year, ſecond after Leap Year, third after Leap Year, and Leap Year. Each Page is divided into 13 Columns, the firſt for the Days, and the reſt for each Month. S. ſtands for South, N. for North, D. for Degrees, and M. for Minutes.

III. The Table of Natural Sines, and *Secants leſs Radius*, takes up 15 Pages. This Table is put into the ſame Order as thoſe of Artificial Sines, Tangents, and Secants, generally are in common Books of Navigation. On the Left Hand firſt Column under M. are the Minutes belonging to the Degrees marked at the Top of the Columns, or from 1 to 45 Degrees: and in the Column to the right Hand under M. are the Minutes anſwering to the Degrees marked at the Bottom of each Column, or from 45 to 90 Degrees. D ſtands for Degrees, N. S. for Natural Sine, and S. L. R. for Secant Leſs Radius.

IV. The Table of Common Logarithms contains 34 Pages, from the Natural Number 1, to 10,000; the firſt Hundred is on the firſt Page, and the reſt follow on in a regular Order, 50 in each Column, or 300 in each Page. N. ſtands for Number, and L. for Logarithm.

A few Examples will render this Explanation compleatly underſtood.

1. Find the Logarithm of Half Elapſed Time for 2 Hours, 22 Minutes, and 30 Seconds?

In the Logarithmic ſolar Tables, of H. II. oppoſite 22 in the Column M. and 30 S. will be found in the Column H. E. T. 0.23472 the Number required. N. B. Here is the Abbreviation mentioned before: 0. for the Index, and 23 are omitted as they remain unaltered the ſame as thoſe juſt above.

2. What is Middle Time correſponding to 5.16516?

Find the Number in the Column M. T. and oppoſite to it in Column M. is 8, at the Top H. III. which is 3 Hours 8 Minutes, the Time ſought.

3. What is the Logarithm Riſing for 4 Hours, 58 Minutes, and 30 Seconds?

In the Table H. IV. oppoſite 58 M. 30 S. and in the Column R. is 4.86621 the Number ſought.

4. It is required to find the Sun's Declination for the 24th of March 1780?

This is Leap Year; oppoſite 24 under Days, and in the Column under March is 1 D. 41 M. North Declination.

5. What is the Natural Sine of 40 D. 54 M?

At the Top of the Page D. 40. oppoſite 54 M. to the left Hand, and in the Column N. S. will be found 65474, the Number ſought. In like manner is the Secant leſs Radius in its reſpective Column.

6. *Item.* The Secant leſs Radius for 53 D. 25 M.?

At the Bottom of the Page, (becauſe it exceeds 45 Degrees) find the Column D. 53. and under S. L. R. oppoſite 25 in the right Hand Column, M. is 0.22476 the Number required.

7. The Logarithm of 9533 is ſought?

Oppoſite 9533 in the Column N. will be found in the Column L. 3.97923. And *vice verſa*,

8. What is the natural Number of the Logarithm 3.90020?

Find that Number, (or the neareſt to it) in the Column L. and oppoſite to it in the Column N. will be 7947 the natural Number required.

N. B. Should it ſo happen, that a higher Number, or its Logarithm, than what is in this Table is required, it is but then ſubſtituting a higher Index inſtead of what is now; thus 54360 will have the ſame Logarithm as 5436, except the former will have 4. for the Index, becauſe the Number given has five Places of Figures.

9. What is the natural Number of the Logarithm 4.79385?

Find the neareſt Logarithm, ſubſtituting 3 for its Index, and that is 3.79386 correſponding to 6221; but as the Index is 4, the natural Number muſt be 5 Figures. The Logarithm is not quite ſo high in the place of Units, as the Logarithm found, the Number muſt conſequently be leſs in Proportion, and therefore but 62209.

INSTRUCTIONS

INSTRUCTIONS FOR THE OPERATION

THE Operation of this Performance is not confined to any particular Quadrant: However, as exact Altitudes are the principal Objects in the Performance, Hadley's Quadrant is highly preferable to any other.*

Two Altitudes are to be taken, with an exact Time by the Watch.

This Watch requires no particular Exactneſs as to the Hour, provided it keeps tolerable good Time; for the true Calculation of the Problem depends on the intermediate Time of the two Altitudes; and the Operation will determine how much the Watch is too faſt or too ſlow.

Care ſhould be taken that the Quadrant is firſt adjuſted at each Altitude, and that the Obſervation be preciſe to a Minute of Time by the Watch: And ſhould it be obſerved that the Watch actually looſes, or gains any conſiderable Time, ſuch may be ſubtracted or added to the Elapſed Time, in Proportion, as that Loſs or gain is found to be in 24 Hours.

The farther Diſtance from the Meridian the Altitudes are taken, the more they are liable to Errors, on Account of the apparent ſwift Motion of the Sun, the Uncertainty of Refraction, &c; but the nearer the Altitudes taken, are towards the Meridian, ſo much the more they may be expected to be exact, on Account of the apparent ſlow Motion of the Sun, &c. and leſs Refraction the Rays are liable to.

The beſt Time therefore for Obſervation, is from 9 in the Morning, till 3 in the Afternoon.

The greateſt Diſtance of Time between the Obſervation ſhould not exceed 5 Hours, (for 6 Hours is it's utmoſt Extent) and the ſmalleſt Diſtance ought not to be leſs than three Quarters of an Hour.

If both Altitudes are taken in the Forenoon, or both in the Afternoon, they muſt be ſubtracted from each other.

But if one is taken in the Forenoon, and one in the Afternoon, then; to the Hour in the Afternoon add 12; from the Sum ſubtract the Hour in the Forenoon, and the Remainder will give the intermediate Time as before.

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* For the proper Uſe of Hadley's Quadrant, and how to take a correct Altitude, the Obſerver is referred to the Appendix.

A ſuppoſed Latitude is one of the Terms given, in order to find the true atitude and true Time of the Day.

This Latitude requires no great Exactneſs, as an Error of 20 or 30 Minutes ill in no wiſe affect the Latitude found; for an Error of 1 or 2 Degrees eſignedly made, will even bring the Work true, if the Operation be done ver again, and the Latitude laſt found be made the ſuppoſed Latitude.

What Difference of Longitude is made in the intermediate Time of Obſer-tion, allow in Proportion, as 15 Miles of Longitude is to 1 Minute of ime; which ſubtract from the Time elapſed, if ſailing Weſtward, and add ſailing Eaſtward.

What Difference of Latitude is made, add to the Firſt Altitude, if obſerved the Forenoon, and if the Courſe and the Altitude be of one Name; but btract, if they be in oppoſite Direction, or if the firſt Altitude is taken in e Afternoon.

This Addition, or Subtraction allow however in Proportion to the Angle hich the Courſe of the Ship makes with the bearing of the Sun by Compaſs; r which a ſlight Inſpection is ſufficient: and may be determined by the ommon Method of Latitude and Departure.

Theſe Precepts will be farther illuſtrated in the Courſe of the following xamples; we ſhall therefore proceed to the Rule itſelf.

The General Rule.

ADJUST your Quadrant; take preciſe (or as near as you can) to a Minute on your Watch, the Altitude; which correct from Refraction, Dip, and e Sun's Semi-Diameter, and call it the true Altitude.*

Subtract the Hours, Minutes and Seconds of Time when each Altitude was ken from each other; and Half the Remainder is Half elapſed Time.

Subtract the Natural Sine of both Altitudes from each other; and the Differ-ce call the Remainder.

To the Secant leſs Radius of the Latitude by Account or ſuppoſed Latitude, d the Secant leſs Radius of the Sun's Declination; and that Sum is the Lo-arithm Ratio.

Add

---

* See the Appendix.

Add the Logarithm Ratio, the common Logarithm of the Remainder, and Logarithm of Half elapſed Time into one Sum, which gives the Logarithm of Middle Time.

The Hours, Minutes and Seconds, anſwering to the Logarithm of Middle Time, ſubtract from Half elapſed Time; the Remainder is that Time which the Sun had to riſe or aſcend to the Meridian, when the greateſt Altitude was taken; and is called Riſing.

Compare the Hours and Minutes of Riſing with the apparent Time by the Watch; and the Difference will ſhew whether the Watch is too faſt or too ſlow.

From the Logarithm of Riſing, ſubtract Logarithm Ratio; the Remainder is a common Logarithm.

The Number of this laſt Logarithm is a Natural Sine, whoſe Degrees and Minutes is that Space which was wanting of the Sun's Meridian Altitude, when the greateſt Altitude was taken.

To the Natural Sine laſt found, add the Natural Sine of the Sun's greateſt Altitude taken; and their Sum is the Natural Sine of the Sun's Meridional Altitude that Day, and at the Place where the greateſt Altitude was taken.

EXAMPLES.

In the firſt two Examples, the Ship is ſuppoſed to keep the ſame Station in the interim of Obſervation.

EXAMPLE I.

At Sea, the 19th of February, 1771. in North Latitude by Account 46 D. 50 M. I took at 10 H. 2 M. the apparent Sun's Altitude of 46° 44′. and again, at 11 H. 27 M. the ſecond apparent Altitude was 53°. 56′. my Eye being 20 Feet above the Surface of the Sea; I require the true Latitude and the true Time of the Day, when the greateſt Altitude was taken?

Firſt of all, Correct the Altitudes:

1ſt. Altitude - -	46. 44.	2d. Altitude - -	53. 56.
for the Dip	00. 5.	Dip - - - -	00. 5.
	46. 39.		53. 51.
Sun's Semi-Diam. -	00. 16.	Sun's Semi-Diam. -	00. 16.
	46. 55.		54. 7.

As the Refraction is here but trifling, I have taken no Notice of it.

H. M. — D. M. — D. M.

At. 10. 2. } Alt. { 46. 55. } N.S. { 73036 — N. Latt. per Acc, 46. 50. N. } S.L.R. { 0.16487
11. 27. } — { 54. 7. } — { 81021 — S. Declin. 11. 18. N. } — { 0.00850

1. 25. — Remainder 7985 } — Log Ratio - - -0.17337
It's Logarithm } - - - - - - - - - - - - - - - 3.90227

0. 42. 30. }
H. E. T. } - — 0.73429

1. 15. 30. M. T.- 4.80993

0. 33. 0. The true Time of Riſing. - - Log R. 3.01488
Log Ratio 0.17337

H. 12.0.0. Meridian — L. 2.84151 - - 694. N.
11. 27. 2d Alt. — Greateſt Alt. it's N. S. - - 81021.

D. M.

33. by the Watch — 81715 N.S. 54. 48. Mer. Alt.
33. true Time of Riſing — 90.

00. Watch right. — Zen. Diſt. 35.12.

{ The Meridian Obſervation made. } Declination. 11 18.
{ this Day, 46 D. 30 M. N. Lat. }

46.30.

EXAMPLE II.

Beating to windward after a hard Gale: In N. Latitude by D. R. 59°. 20'. and N. Declination 20 D. 54 M. at 11 H. 45 M. A. M. I took from my Quadrant 50 D. 41 M. my Eye being 22 Feet above the Surface of the Sea: Again, at 40 Minutes P. M. the ſecond Apparent Altitude was 51°. 11'. having neither made Longitude nor Latitude in the interim. I demand my Latitude and the true Time when the greateſt Altitude was taken?

Time.	true Altitudes.			D. M.	S.L.R.
H. M.	D. M.	N.S.			
11. 45. - - -	50. 52. - - -	77568.	N. Latitude by D. R. -	59 20.	0.29239
12. 40. - - -	51. 22. - - -	78116.	Sun's Declination N.	20. 54.	0.02956

Log. Ratio - - - - 0.32195.

55. E. T. — 548. Remainder, its Logarithm - - - - - - 2.73878

27. 30. H. E. T. - 0.92189

11. 00. M. T. - 3.98262

16. 30. R. - - - - - - - - - - 2.41338.
20. 00 per Watch. — Log. Rat. 0.32195.

3 30 too faſt. — 2.09143. Logar, its Number 124.
51° 21' N.S. 78116.

51. 29. N.S. 78240.
90.

38. 31.
Sun's Declinat. 20. 54.

59. 24. the true Latitude.

EXAMPLE III.

Sailing weſtward. A deficient ſuppoſed Latitude. And an erroneous Watch.

Having for ſome Days together had foggy Weather: On the 7th of February, 1770, at 9. 6. A. M. I obſerved the Sun's true Altitude to be 21°. 00'. the Sun bearing S. b. E. by Compaſs: and again at 12. 23. P. M. the ſecond Altitude 28. 21. My Latitude by Acc. 43°. 45'. N. the Ship going E. b. N. 6 Kts. My Watch I had frequently obſerved before, to loſe 15 Minutes of Time in 24 Hours. Require the Latitude, and true Time?

3. H. 18. M. at 6 Knts. = 19 M. which by the Table of Lat. and Depart. makes 18 Mil. E. Long. and 3 Lat. Now for 18 M. allow 1 Min. of Time. But as the bearing of the Sun at the firſt Alt. was at right Angle with the Courſe, the Proportion will be 2 Min. nearly; which Subtract from the firſt Alt.

9. H. 6 M.
14. 23.
3. 17.
for loſing by the Watch - 0. 1.
3. 18.
Difference of Long in Time 0. 1.

Lat. per Acc. 43. 45. 0.14124
South Decl. 15. 14. 0.01553

D. M.   3 19.   0.15677
21. 00. cor. Alt.   1. 38. 30. H. E. T. - - - - - - - - - - - - - - 0.38020
2. diff. Lat.   11704. it's Log. - - - - - - - 4.06819
20. 58. N.S. 35782   46. 30. M. T. - - - - - - - - - 4.60516
28. 21. - - 47486   1. 38. 30. H. E. T.
11704   52. R. - - - 3. 40875
Log. R. 0. 15677
12.   3. 25198 - - 1786
23   47486
37 by the Watch.   29. 31. - - - 49272
52 true Riſing.   90.
15 the Watch too faſt.   60. 29. Sun's Zenith Diſt.
15. 14. S. Declin.
45. 15.

Here we find that the Watch being 15 Minutes too ſlow in Time, and 15 Minutes too faſt by the Hour, and likewiſe that the Latitude found differs from the ſuppoſed by 1 D. 30 M; for which Reaſon the Calculation muſt be repeated, and the laſt Latitude made the ſuppoſed one.

Laſt Latitude 45. 15. 0. 15242
Declination - - - - 0. 01553
- - 0. 16795
0. 38020
4. 06819
M.T. 47. 30. - - - - - - - - - - - - 4. 61634
H.E.T. 1. 38. 30.
51. R. - - 3. 39195
by the Watch 37. 0. 16795
14 Min. too faſt 3. 22400 - - 1675
47486

Here we find the Difference but 6 Miles and therefore this laſt Latitude may be depended on as the true one.

49161 - - 29. 27
60. 33
15. 14
45. 19

EXAMPLE IV.

The Watch out of Order.

On the 29th of December, 1769, in the Latitude by Account of 44 Deg. ſome Time in the Morning, I took a correct Altitude of 20, 58, at that Moment turning an Hour, and an Half Hour Glaſs, both very good: (my Watch being out of Order) the third Half Hour being nearly run out, the Sun made its Appearance again, and at the Moment it was done, I had the ſecond Altitude, which corrected, was 22 D. 29 M. The Ship went 9 Knots on a W. S. W. Courſe: and the firſt Alt. bore by Compaſs S. b. E. Require the true Time of the greateſt Altitude, as alſo the true Latitude?

The Diſtance run is 13 Miles, which by the Tables of Latitude and Departure, is 12 Miles Weſt Longitude, and 5 South Latitude.

5 Miles Latitude with the Bearing of the Sun, makes about 4.

```
         Firſt Altitude   20. 58.
                               4. Diff. Latt.      N. Lat. per Acc. 44 00 - -  0. 14307
1. 30. by the Glaſs       21.  2. - - 35891            Declinat. S. 23 14 - -  0 03673
    1. for Longitude      22. 29. - - 38241                                    0. 17980
1. 31.                                 2351 - - - - - - - - - - - - - - - -   3. 37125
0. 45. 30. H. E. T. - - - - - - - - - - - - - - - - - - - - - - - - - - - -   0. 70503
  20. 30. M. T. - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   4. 25608
  25. R. - - - - - - -              2. 77405
12 .                                0 17980
11. 35. was the Time when the       2. 59425 - - -   393
    greateſt Altitude was taken                     38241.
                                                    38634. - - -  22 44
    A good Obſervation was had at Noon,                           67 16
        and both agreed exactly                                   23 14
                                                                  44  2
```

Theſe Examples I apprehend will ſuffice; as they include Variety enough for a practical Seaman to improve by. I might doubtleſs have added many Examples more; for which however I can ſee but little Occaſion: Since Opportunities occur almoſt daily at Sea, whereby the Obſerver may exerciſe his Fancy, ſo as to make himſelf perfect, as well in the general Method, as in a Variety of Caſes: And I am fully perſuaded, that a few *ſerious* Trials, will make the whole familiar and eaſy in Practice.

The different Caſes that this Operation is ſubject to, are; 1ſt, The Ship keeping the ſame Station in the interim of Obſervation; this however is ſeldom the Caſe; yet frequently the Difference not worth Notice in the Calculation. 2d. Sailing Weſtward. 3d. Eaſtward. 4th. North or South; towards, or from the Sun. 5th. On any Point of the Compaſs. 6th. Suppoſed Latitude and Declination of one Name. 7th. Of oppoſite Denomination. 8th. Both Altitudes in the Forenoon. 9th. Both in the Afternoon. 10th. One Altitude in the Forenoon, and one in the Afternoon. 11th. An erroneous Watch. And 12th. No Watch at all. In all theſe Caſes, I have nothing more to add, than 1ſt. The nearer the Altitudes are taken towards the Meridian, the better. 2d. Beſt likewiſe; if both Altitudes are either in the Forenoon, or both in the Afternoon. 3d. All the Niceneſs of the Operation depends chiefly on correct Altitudes, and correct intermediate Time.

I ſhall therefore beg Leave to conclude with the following well-meant Advice; and in particular to thoſe who hitherto have been unacquainted with the *Practice* of this important Problem.

Read the Whole *Attentively* through.

Turn next to the Examples, and compare every Step with the Inſtructions, the Rule, and the Tables.

Take the firſt Opportunity to imitate them with original ones; vary them as Circumſtances ſhall direct, and Fancy may lead you to ſuppoſe, *what one Time or other may actually be the Caſe.*

Pen theſe Examples neatly down: for beſides, that this greatly ſtrengthens the Memory, it will ſerve on ſimilar Caſes to be referred to.

And thus, I flatter myſelf, you will with Satisfaction reap that Benefit which hereby is intended.

LOGARITHM

LOGARITHMIC SOLAR TABLES

OF

HALF ELAPSED TIME,

MIDDLE TIME,

AND

RISINR,

For SIX HOURS,

To every MINUTE and HALF MINUTE.

LOGARITHMIC SOLAR TABLES.

H. O.

M.	S.	H. E. T.	M. T.	R.	M.	S.	M. S. T.	M. T.	R.
0	30	2. 66121	2. 63982	C.A. } 27654	30	30	0. 87717	4. 42386	2. 94650
1		36018	94085	97860	31		7015	3988	6067
1	30	18409	3. 11694	0. 33079	31	30	6324	3779	7454
2		05916	24187	58066	32		5644	4459	8820
2	30	1. 96225	33878	77448	32	30	4976	5127	3. 00164
3		88707	41796	03284	33		4317	5786	1488
3	30	1. 81613	3. 48490	1. 06673	33	30	0. 83669	4. 46434	3. 02792
4		75814	54289	18271	34		3030	7073	4077
4	30	0700	9403	28502	34	30	2401	7702	5342
5		66125	63978	37653	35		1780	8323	6590
5	30	1986	8117	45931	35	30	1169	8934	7819
6		58208	71895	53488	36		0567	9536	9032
6	30	1. 54733	3. 75370	1, 60440	36	30	0. 79973	4. 50130	3. 10227
7		1515	8588	6877	37		9387	0716	1406
7	30	48520	81583	72869	37	30	8809	1294	2570
8		5718	4385	8474	38		8239	1864	3718
8	30	3086	7017	83739	38	30	7677	2426	4850
9		0605	9498	8703	39		7122	2981	5969
9	30	1. 38258	3. 91845	1. 93399	39	30	0. 76574	4. 53529	3. 17072
10		6032	4071	7854	40		6033	4070	8162
10	30	3915	6188	2. 02091	40	30	5499	4604	9238
11		1896	8207	6131	41		4972	5131	20301
11	30	29967	4. 00136	9991	41	30	4451	5652	1351
12		8120	1983	13687	42		3937	6166	2389
12	30	1. 26349	4. 03754	2. 17223	42	30	0. 73429	4. 56674	3. 23414
13		4647	5456	20638	43		2926	7177	4427
13	30	3010	7093	3915	43	30	2430	7673	5428
14		1432	8617	7073	44		1940	8163	6418
14	30	19910	10193	30120	44	30	1455	8648	7396
15		8440	1663	3063	45		0976	9127	8363
15	30	1. 17018	4. 13085	2, 35910	45	30	0. 70503	4. 59600	3. 29320
16		5642	4461	8667	46		0034	60069	30266
16	30	4307	5796	41338	46	30	69571	0532	1202
17		3013	7090	3930	47		9113	0990	2128
17	30	1757	8346	6447	47	30	8660	1443	3044
18		0536	9567	8·93	48		8212	1891	3950
18	30	1. 09348	4. 20755	2, 51271	48	30	0. 67769	4. 62334	3. 34847
19		8193	1910	3586	49		7330	2773	5734
19	30	7067	3036	5841	49	30	6806	3207	6613
20		5970	4133	8039	50		6466	3637	7482
20	30	4901	5202	60182	50	30	6041	4062	8343
21		3857	6246	2274	51		5620	4483	9195
21	30	1. 02838	4. 27265	2. 64316	51	30	0. 65204	4. 64899	3. 40039
22		1843	8260	6312	52		4791	5312	0875
22	30	0870	9233	8262	52	30	4383	5720	1702
23		0. 99918	30185	70169	53		3978	6125	2522
23	30	8988	1115	2036	53	30	3578	6525	3334
24		8077	2026	3863	54		3181	6922	4138
24	30	0. 97184	4. 32919	2. 75652	54	30	0. 62789	4. 67314	3. 44935
25		6310	3793	7405	55		2400	7703	5724
25	30	5454	4649	9124	55	30	2014	8089	6507
26		4614	5489	80809	56		1632	8471	7282
26	30	3791	6313	2461	56	30	1254	8849	8050
27		2082	7121	4083	57		0879	9224	8811
27	30	0. 92189	4. 37914	2. 85675	57	30	0. 60508	4. 69595	3. 49566
28		1411	8692	7238	58		0140	9963	50314
28	30	0646	9457	8773	58	30	59775	70328	1056
29		89894	40209	90282	59		9414	0689	1791
29	30	9156	0947	1765	59	30	9056	1047	2520
30		8430	1673	3223	60		8700	1403	3243

LOGARITHMIC SOLAR TABLES.

H.					I.				
M.	S.	H. E. T.	M. T.	R.	M.	S.	H. E. T.	M. T.	R.
00	30	0. 58348	4. 71755	3. 53959	30	30	0. 41488	4. 88615	3. 88625
1		7999	2104	4670	31		261	842	9097
1	30	653	450	5375	31	30	036	9067	567
2		310	793	6074	32		0812	291	90034
2	30	6970	3133	767	32	30	590	513	498
3		633	470	7455	33		368	735	960
3	30	0. 56298	4, 73805	3. 58137	33	30	0. 41049	4. 89954	3. 91420
4		5966	4137	814	34		39930	90173	876
4	30	637	466	9486	34	30	713	390	2331
5		311	792	60152	35		497	606	782
5	30	4987	5116	813	35	30	282	821	3232
6		666	437	1469	36		069	1034	679
6	30	0. 54347	4. 75756	3. 62120	36	30	0. 38856	4. 91247	3. 94123
7		031	6072	766	37		646	457	566
7	30	3718	385	3407	37	30	436	667	5005
8		406	697	4043	38		227	876	443
8	30	097	7005	675	38	30	020	2083	878
9		2791	312	5302	39		7813	290	6311
9	30	0. 52488	4. 77615	3. 65924	39	30	0. 37609	4. 92494	3. 96742
10		186	917	9542	40		405	698	7170
10	30	1886	8217	7156	40	30	202	901	597
11		589	514	756	41		001	3102	8021
11	30	294	809	8369	41	30	6800	303	443
12		002	9101	969	42		602	501	862
12	30	0. 50711	4. 79392	3. 69566	42	30	0. 36404	4. 93699	3. 99280
13		423	680	70158	43		206	897	696
13	30	137	966	745	43	30	011	4092	4. 00109
14		49852	80251	1329	44		5816	287	521
14	30	570	533	909	44	30	622	481	930
15		290	813	2485	45		430	674	1337
15	30	0. 49012	4. 21091	3. 73057	45	30	0. 35238	4. 94865	4. 01743
16		8736	367	625	46		047	5056	2146
16	30	462	641	4189	46	30	4858	245	547
17		189	914	750	47		669	434	947
17	30	7919	2184	5307	47	30	482	621	3344
18		650	453	860	48		296	807	740
18	30	0. 47883	4. 82720	3. 76409	48	30	0. 34110	4. 95993	4. 04134
19		119	984	955	49		3925	6178	526
19	30	6856	3247	7498	49	30	742	361	916
20		595	508	8037	50		559	544	5304
20	30	335	768	573	50	30	378	725	690
21		077	4026	9105	51		197	906	6074
21	30	0. 45822	4. 84281	3. 79634	51	30	0. 33017	4. 97085	4. 06457
22		567	536	80159	52		2839	264	838
22	30	315	788	682	52	30	661	442	7217
23		064	5039	1201	53		485	618	595
23	30	4815	288	717	53	30	309	794	970
24		567	536	2230	54		134	969	8344
24	30	0. 44321	4, 85782	3. 82739	54	30	0. 31960	4. 98143	4. 08716
25		077	6026	3246	55		787	316	9087
25	30	3834	269	749	55	30	614	489	456
26		593	510	4250	56		443	660	823
26	30	353	750	748	56	30	272	831	10188
27		114	989	5242	57		103	9000	552
27	30	0. 42877	4. 87226	3. 85734	57	30	0. 30934	4. 99169	4. 10915
28		643	460	6223	58		766	337	1275
28	30	409	694	709	58	30	599	504	634
29		176	927	7192	59		433	670	992
29	30	1945	8158	672	59	30	268	835	2348
30		716	387	8150	60		103	5. 00000	702

LOGARITHMIC SOLAR TABLES.

H.					II.				
M.	S.	H. E. T.	M. T.	R.	M.	S.	H. E. T.	M. T.	R.
0	30	0. 29939	5. 00164	4. 13055	30	30	0. 21432	5. 08671	4. 31801
1		776	327	406	31		309	794	2079
1	30	614	489	706	31	30	187	916	356
2		453	650	4104	32		066	9037	631
2	30	293	810	451	32	30	0945	158	906
3		133	970	797	33		824	279	3180
3	30	0. 28974	5. 01129	4. 15140	33	30	0. 20704	5. 09399	4. 33453
4		816	287	483	34		585	518	724
4	30	659	444	824	34	30	466	637	995
5		502	601	6113	35		348	755	4265
5	30	346	757	501	35	30	230	873	534
6		191	912	838	36		113	990	802
6	30	0. 28037	5. 02066	4. 17173	36	30	0. 19996	5. 10107	4. 35069
7		7884	219	507	37		880	223	335
7	30	731	372	839	37	30	764	339	601
8		579	524	8171	38		649	454	865
8	30	428	675	500	38	30	534	569	6128
9		277	826	828	39		420	683	391
9	30	0. 27127	5. 02976	4. 19156	39	30	0. 19306	5. 10797	4. 36652
10		6978	3125	482	40		193	910	913
10	30	830	275	806	40	30	081	1022	7173
11		682	421	20129	41		8968	135	432
11	30	535	568	451	41	30	857	246	690
12		389	714	771	42		746	357	948
12	30	0. 26244	5. 03859	4. 21091	42	30	0. 18635	5. 11468	4. 38204
13		099	4004	409	43		525	578	459
13	30	5955	148	725	43	30	415	688	714
14		811	292	2041	44		306	797	968
14	30	668	435	355	44	30	197	906	9221
15		526	577	668	45		089	2014	473
15	30	0. 25385	5. 04718	4. 22980	45	30	0. 17981	5. 12122	4. 39725
16		244	859	3290	46		874	229	975
16	30	104	999	599	46	30	767	336	40225
17		4964	5139	907	47		660	443	474
17	30	825	278	4214	47	30	554	549	722
18		687	416	520	48		449	654	969
18	30	0. 24550	5. 05553	4. 24825	48	30	0. 17344	5. 12759	4. 41215
19		413	690	5128	49		239	864	461
19	30	276	827	430	49	30	135	968	706
20		141	962	731	50		032	3071	950
20	30	006	6097	6031	50	30	6928	175	2193
21		3871	232	330	51		826	277	435
21	30	0. 23738	5. 06365	4. 26628	51	30	0. 16724	5. 13379	4. 42677
22		605	498	924	52		622	481	918
22	30	472	631	7220	52	30	520	583	3158
23		340	763	514	53		419	684	398
23	30	209	894	807	53	30	319	784	636
24		078	7025	8099	54		219	884	874
24	30	0. 22948	5. 07155	4. 28391	54	30	0. 16119	5. 13984	4. 44111
25		819	284	681	55		020	4083	348
25	30	690	413	969	55	30	5921	182	4588
26		561	542	9257	56		823	280	818
26	30	433	670	544	56	30	725	378	5052
27		306	797	830	57		628	475	286
27	30	0. 22180	5. 07923	4. 30115	57	30	0. 15530	5. 14573	4. 45518
28		054	8049	398	58		434	669	750
28	30	1928	175	684	58	30	338	765	981
29		803	300	1963	59		242	861	6212
29	30	679	424	143	59	30	146	975	442
30		555	548	523	60		051	5052	671

LOGARITHMIC SOLAR TABLES.

H. III,

M.	S.	H. E. T.	M. T.	R.	M.	S.	H. E. T.	M. T.	R.
0	30	0. 14957	5. 15146	4. 46899	30	30	0. 09981	5. 20122	4. 59436
1		863	230	7127	31		909	194	627
1	30	769	334	354	31	30	837	266	818
2		676	427	580	32		765	338	60008
2	30	583	520	806	32	30	694	409	198
3		490	613	8031	33		623	480	387
3	30	0. 14398	5. 15705	4. 48255	33	30	0. 09552	5. 20551	4. 60576
4		307	796	479	34		482	621	764
4	30	215	888	701	34	30	412	691	952
5		124	979	924	35		343	760	1139
5	30	034	6069	9145	35	30	273	830	326
6		3944	159	366	36		204	899	512
6	30	0. 13854	5. 16249	4. 49586	36	30	0. 09136	5. 20967	4. 61698
7		765	338	806	37		067	1036	883
7	30	676	427	50025	37	30	8999	104	2068
8		587	516	243	38		931	172	252
8	30	399	604	461	38	30	864	239	436
9		411	692	677	39		797	306	619
9	30	0. 13324	5. 16779	4. 50894	39	30	0. 08730	5. 21373	4. 62802
10		237	866	1109	40		664	439	984
10	30	150	953	324	40	30	597	506	3166
11		064	7039	539	41		531	572	347
11	30	2978	125	753	41	30	466	637	528
12		893	210	966	42		401	702	708
12	30	0. 12807	5. 17296	4. 52178	42	30	0. 08336	5. 21767	4. 63888
13		723	380	390	43		271	832	4068
13	30	638	465	601	43	30	207	896	246
14		554	549	812	44		143	960	425
14	30	471	632	3022	44	30	079	2024	603
15		387	716	231	45		015	088	780
15	30	0. 12305	5. 17798	4. 53440	45	30	0. 07952	5. 22151	4. 64957
16		222	881	648	46		889	214	5134
16	30	140	963	856	46	30	827	276	310
17		058	8045	4063	47		765	338	486
17	30	1977	126	269	47	30	703	400	661
18		895	208	475	48		641	462	836
18	30	0. 11815	5. 18288	4. 54680	48	30	0. 07579	5. 22524	4. 66010
19		734	369	885	49		518	585	184
19	30	654	449	5089	49	30	458	645	357
20		575	528	293	50		397	706	530
20	30	495	608	496	50	30	337	766	702
21		416	687	698	51		277	826	874
21	30	0. 11338	5. 18765	4. 55900	51	30	0. 07217	5. 22886	4. 67046
22		259	844	6101	52		158	945	217
22	30	181	922	301	52	30	099	3004	338
23		104	999	501	53		040	063	558
23	30	027	9076	701	53	30	6982	121	728
24		0950	153	900	54		923	180	897
24	30	0. 10873	5. 19230	4. 57098	54	30	0. 06865	5. 23238	4. 68066
25		797	306	296	55		808	295	235
25	30	721	382	494	55	30	751	352	403
26		646	457	690	56		693	410	571
26	30	570	533	886	56	30	637	466	738
27		495	608	8082	57		580	523	905
27	30	0. 10421	5. 19682	4. 58277	57	30	0. 06524	5. 23579	4. 69071
28		347	756	471	58		468	635	237
28	30	272	831	665	58	30	412	691	403
29		199	904	859	59		357	746	568
29	30	126	977	9052	59	30	302	801	733
30		053	20050	244	60		247	856	897

LOGARITHMIC SOLAR TABLES.

H. I.

M.	S.	H. E. T.	M. T.	R.	M.	S.	H. E. T.	M. T.	R.
0	30	0. 06192	5. 23911	4. 70061	30	30	0. 03399	5. 26704	4. 79192
1		138	965	224	31		360	743	334
1	30	084	4019	387	31	30	322	781	475
2		030	073	550	32		283	820	615
2	30	5977	126	712	32	30	245	858	756
3		924	179	874	33		207	896	896
3	30	0. 05871	5. 24232	4. 71036	33	30	0. 03170	5. 26933	4. 80035
4		818	285	197	34		132	971	175
4	30	766	337	357	34	30	095	7008	314
5		714	389	518	35		058	045	455
5	30	662	441	678	35	30	021	082	491
6		610	493	837	36		2985	118	729
6	30	0. 05559	5. 24544	4. 71996	36	30	0. 02949	5. 27154	4. 80866
7		508	595	2155	37		913	190	1004
7	30	457	646	313	37	30	877	226	141
8		406	697	471	38		841	262	277
8	30	356	747	628	38	30	806	297	414
9		306	797	785	39		771	332	550
9	30	0. 05257	5. 24846	4. 72942	39	30	0. 02736	5. 27367	4 81686
10		207	896	3098	40		701	402	821
10	30	158	945	254	40	30	667	436	956
11		109	994	410	41		633	470	2091
11	30	060	5043	565	41	30	599	504	226
12		012	091	720	42		565	538	360
12	30	0. 04964	5. 25139	4. 73874	42	30	0. 02532	5. 27571	4. 82494
13		916	187	4028	43		499	604	628
13	30	868	235	182	43	30	466	637	761
14		821	282	335	44		433	670	894
14	30	774	329	488	44	30	400	703	3026
15		727	376	641	45		368	735	159
15	30	0. 04680	5. 25423	4. 74793	45	30	0. 02336	5. 27767	4. 83291
16		634	469	945	46		304	799	423
16	30	588	515	5096	46	30	273	830	554
17		542	561	247	47		241	862	685
17	30	496	607	398	47	30	210	893	816
18		451	652	549	48		179	924	947
18	30	0. 04406	5. 25697	4. 75699	48	30	0. 02149	5. 27954	4. 84077
19		361	742	848	49		118	985	207
19	30	317	786	997	49	30	088	8015	337
20		272	831	6146	50		058	045	466
20	30	228	875	295	50	30	028	075	595
21		185	918	443	51		1999	104	724
21	30	0. 04141	5. 25962	4. 76591	51	30	0. 01969	5. 28134	4. 84852
22		098	6005	738	52		940	163	981
22	30	055	048	885	52	30	912	191	5108
23		012	091	7032	53		883	220	236
23	30	3969	134	179	53	30	854	249	363
24		927	176	325	54		826	277	490
24	30	0. 03885	5. 26218	4. 77470	54	30	0. 01798	5. 28305	4. 85617
25		843	260	616	55		771	332	744
25	30	802	301	761	55	30	743	360	870
26		760	343	906	56		716	387	996
26	30	719	384	8050	56	30	689	414	6121
27		678	425	194	57		662	441	246
27	30	0. 03638	5. 26465	4. 78338	57	30	0. 01635	5. 28468	4. 86372
28		597	506	481	58		609	494	496
28	30	557	546	624	58	30	583	520	621
29		517	586	767	59		557	546	745
29	30	478	625	908	59	30	531	572	869
30		438	665	9051	60		506	597	992

LOGARITHMIC SOLAR TABLES.

N° V.

M.	S.	H. E. T.	M. T.	R.	M.	S.	H. E. T.	M. T.	R.
0	30	0. 01480	5. 28623	4. 87116	30	30	0. 00361	5. 29742	4. 94034
1		455	648	239	31		349	754	141
1	30	430	673	362	31	30	337	766	249
2		406	697	484	32		325	778	356
2	30	381	722	606	32	30	313	790	463
3		357	746	728	33		302	801	570
3	30	0. 01333	5. 28770	4. 87850	33	30	0. 00291	5. 29812	4. 94676
4		310	793	971	34		280	823	782
4	30	286	817	8093	34	30	269	834	888
5		263	840	213	35		259	844	994
5	30	240	863	334	35	30	249	854	5100
6		217	886	454	36		239	864	205
6	30	0. 01194	5. 28909	4. 88574	36	30	0. 00229	5. 29874	4. 95310
7		172	931	694	37		219	884	415
7	30	150	953	814	37	30	210	893	520
8		128	975	933	38		200	903	624
8	30	106	997	9052	38	30	191	912	728
9		084	9010	171	39		183	920	832
9	30	0. 01063	5. 29040	4. 89289	39	30	0. 00174	5. 29929	4. 95936
10		042	061	407	40		166	937	6040
10	30	021	082	525	40	30	157	946	143
11		000	103	643	41		149	954	246
11	30	0980	123	760	41	30	142	961	349
12		960	143	877	42		134	060	451
12	30	0. 00940	5. 29163	4. 89994	42	30	0. 00127	5. 29976	4. 96554
13		920	183	90111	43		120	983	656
13	30	900	203	227	43	30	113	990	758
14		881	222	343	44		106	997	860
14	30	862	241	459	44	30	099	30004	961
15		843	260	575	45		092	010	7062
15	30	0. 00824	5. 29279	4. 90690	45	30	0. 00087	5. 30016	4. 97163
16		805	298	805	46		081	022	264
16	30	787	316	920	46	30	075	028	365
17		769	334	1034	47		070	033	465
17	30	751	352	149	47	30	065	038	565
18		733	370	263	48		060	043	665
18	30	0. 00716	5. 29387	4. 91377	48	30	0. 00055	5. 30048	4. 97915
19		699	404	490	49		050	053	865
19	30	682	421	603	49	30	046	058	964
20		665	438	716	50		041	062	8063
20	30	648	455	830	50	30	037	066	162
21		632	471	942	51		033	070	261
21	30	0. 00616	5. 29487	4. 92054	51	30	0. 00030	5. 30073	4. 98359
22		600	503	166	52		026	077	457
22	30	584	519	278	52	30	023	080	555
23		568	535	390	53		020	083	653
23	30	553	550	501	53	30	017	086	751
24		538	565	612	54		015	088	848
24	30	0. 00523	5. 29580	4. 92723	54	30	0. 00013	5. 30090	4. 98945
25		508	595	833	55		010	092	9042
25	30	494	609	944	55	30	008	094	139
26		480	623	3054	56		007	096	235
26	30	466	637	164	56	30	005	098	332
27		452	651	273	57		004	099	428
27	30	0. 00438	5. 29665	4. 93383	57	30	0. 00003	5. 30100	4. 99524
28		425	678	492	58		002	101	619
28	30	412	691	600	58	30	001	102	715
29		399	704	709	59		000	103	810
29	30	386	717	817	59	30	000	103	905
30		373	730	926	60		000	103	5. 00000

A

TABLE

OF THE

SUN's DECLINATION,

FROM

The YEAR 1778 to 1800.

A TABLE of the SUN's DECLINATION,

FIRST AFTER LEAP YEAR.

1781. 1785. 1789. 1793. 1797.

	S.		S.		S.		N.		N.		N		N.		N.		N.		S.		S.		S.	
	Jan.		Feb.		March		April		May		June		July		August		Sept.		Oct.		Nov.		Dec.	
	D.	M.	D.	M.	D	M.	D.	M.	D.	M.	D.	M.	D	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
1	23.	00	16.	54	7.	24	4.	43	15.	13	22.	8	23.	8	17.	59	8.	10	3.	20	14.	36	21.	55
2	22.	54		41		1	5.	6		31		16		4		44	7.	49		44		55	22.	4
3		48		23	6.	38		29		48		23	22.	59		28		27	4.	7	15.	14		13
4		42		5		15		52	16.	5		30		54		12		5		30		33		21
5		35	15.	46	5.	52	6.	15		23		37		48	16.	56	6.	42		54		51		29
6	22.	28	15.	28	5.	29	6.	37	16.	40	22.	43	22.	42	16.	39	6.	20	5.	17	16.	9	22.	36
7		20		10		6	7.	0		56		49		36		22	5.	57		40		27		43
8		12	14.	51	4.	42		22	17.	13		55		29		5		34	6.	3		44		49
9		4		31		19		45		29	23.	0		22	15.	48		12		26	17.	1		55
10	21.	55		12	3.	55	8.	7		44		5		15		31	4.	49		48		18	23.	0
11	21.	45	13.	52	3.	32	8.	29	18.	0	23.	9	22.	7	15.	13	4.	26	7.	11	17.	35	23.	5
12		35		32		8		51		15		13	21.	58	14.	55		3		34		51		10
13		25		12	2.	44	9.	13		30		16		50		36	3.	40		56	18.	7		14
14		14	12.	51		21		34		44		19		41		18		17	8.	19		23		17
15		3		31	1.	57		55		59		22		31	13.	59	2.	54		41		38		20
16	20.	52	12.	11	1.	33	10.	17	19.	13	23.	24	21.	22	13.	40	2.	31	9.	3	18.	53	23.	23
17		40	11.	50		10		38		26		26		11		21		7		25	19.	8		25
18		28		28	0.	46		59		39		27		1		2	1.	44		47		23		27
19		15		6		22	11.	20		52		28	20.	50	12.	42		21	10.	9		37		28
20		2	10.	45	N.	1		40	20.	5		29		38		22	0.	57		31		50		29
21	19.	49	10.	23	0.	25	12.	1	20.	17	23.	29	20.	27	12.	2	0.	34	10.	52	20.	4	23.	29
22		35		1		49		21		29		29		15	11.	42		11	11.	13		17		29
23		21	9.	39	1.	12		41		41		28		3		22	S.	13		34		29		28
24		6		17	.	36	13.	1		52		27	19.	51		1	0.	36		55		41		27
25		50	8.	55	2.	00		20	21.	3		26		38	10.	40	1.	0	12.	16		53		25
26	18.	36	8.	32	2.	25	13.	37	21.	13	23.	24	19.	25	10.	19	1.	23	12.	37	21.	4	23.	23
27		21		10		47		59		23		21		11	9.	58		46		57		15		21
28		5	7.	47	3.	10	14.	18		33		19	18.	57		37	2.	10	13.	17		26		18
29	17.	49				33		36		42		15		43		16		33		37		36		14
30		32				57		55		51		12		29	8.	54		56		57		46		10
31		15			4.	40			22.	9				13		32			14.	17				6

A TABLE of the SUN's DECLINATION,

SECOND AFTER LEAP YEAR.

1778. 1782. 1786. 1790. 1794. 1798.

	S.		S.		S.		N.		N.		N.		N.		N.		N.		S.		S.		S.	
Days	Jan.		Feb.		March		April		May		June		July		Auguſt		Sept.		Oct.		Nov.		Dec.	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
1	23.	1	17.	3	7.	30	4.	37	15.	8	22.	6	23.	8	18.	2	8.	15	3.	15	14	31	21.	54
2	22.	55	16.	45		7	5.	0		26		14		4	17.	47	7.	54		38		50	22.	3
3		49		27	6.	44		23		44		22	22.	59		31		32	4.	2	15.	9		12
4		43		10		21		46	16.	1		29		54		15		10		25		28		20
5		37	15.	52	5.	58	6.	9		18		36		49	16.	59	6.	47		48		47		27
6	22.	30	15.	33	5.	34	6.	32	16.	35	22.	43	22.	43	16.	43	6.	25	5.	11	16.	5	22.	34
7		23		14		10		54		52		49		37		27		2		34		23		41
8		15	14.	55	4.	46	7.	17	17.	9		54		30		10	5.	39		57		41		48
9		6		36		23		39		25		59		23	15.	53		17	6.	20		58		54
10	21.	57		16		0	8.	1		41	23.	4		16		35	4.	54		43	17.	15	23.	9
11	21.	48	13.	57	3.	37	8.	23	17.	56	23.	8	22.	8	15.	17	4.	32	7.	5	17.	32	23.	5
12		38		37		14		45	18.	11		12		0	14.	59		9		28		48		10
13		28		17	2.	50	9.	7		26		15	21.	52		41	3.	46		50	18.	4		14
14		17	12.	57		26		29		41		18		43		23		23	8.	13		20		17
15		6		36		3		50		56		21		34		4	3.	0		35		35		20
16	20.	55	12.	15	1.	40	10.	11	19.	10	23.	23	21.	24	13.	45	2.	37	8.	57	18.	50	23.	23
17		43	11.	54		16		32		24		25		14		26		14	9.	19	19.	05		25
18		31		33	0.	52		53		37		27		4		7	1.	50		41		19		27
19		18		11		28	11.	14		50		28	20.	53	12.	47		27	10.	3		33		28
20		5	10.	49		5		35	20.	2		29		42		27		3		25		47		29
21	19.	52	10.	28	N.	19	11.	55	20.	14	23.	29	20.	30	12.	7	0.	39	10.	47	20.	0	23.	29
22		38		7	0.	43	12.	15		26		29		18	11.	47		16	11.	8		13		29
23		24	9.	45	1.	6		35		38		28		6		27	So.	8		29		26		28
24		10		23		30		55		50		27	19.	54		6	0.	31		50		38		27
25	18.	55		0		53	13.	15	21.	1		26		41	10.	45		54	12.	11		50		26
26	18.	40	8.	38	2.	17	13.	34	21.	11	23.	24	19.	28	18.	24	1.	17	12.	32	21.	2	23.	24
27		25		15		40		53		21		21		15		3		40		52		13		21
28		9	7.	53	3.	4	14.	12		31		18		1	9.	42	2.	4	13.	12		24		18
29	17.	53				27		31		40		15	18.	47		20		28		32		34		15
30		37				51		50		49		12		33	8.	58		52		52		44		11
					4.	14				58				18		36			14.	12				7

A TABLE of the SUN's DECLINATION,

THIRD AFTER LEAP YEAR.

1779. 1783. 1787. 1791. 1795. 1799.

	S.		S.		S.		N.		N.		N.		N.		N.		N.		S.		S.		S.	
	Jan.		Feb.		March		April		May		June		July		August		Sept.		Oct.		Nov.		Dec.	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M	D.	M	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
1	23.	2	17.	6	7.	36	4.	31	15.	4	22.	4	23.	9	18.	6	8.	22	3.	8	14.	26	21.	52
2	22.	57	16.	49		13		54		22		12		5	17.	51		0		32		46	22.	1
3		51		31	6.	50	5.	17		40		20		1		35	7.	38		55	15.	5		9
4		45		14		27		40		58		27	22.	56		19		16	4.	18		24		27
5		39	15.	56		3	6.	3	16.	15		34		50		4	6.	54		41		42		25
6	22.	32	15.	38	5.	40	6.	26	16.	32	22.	40	22.	44	16.	48	6.	32	5.	4	16.	0	22.	32
7		24		19		17		48		49		46		38		31		9		27		18		39
8		16		0	4.	54	7.	10	17.	5		52		32		14	5.	46		50		36		45
9		8	14.	41		30		33		21		57		25	15.	57		23	6.	13		54		51
10	21.	59		22		7		56		37	23.	2		18		39		0		36	17.	11		57
11	21.	50	14.	2	3.	43	8.	18	17.	52	23.	7	22.	10	15.	21	4.	38	6.	59	17.	28	23.	2
12		40	13.	42		20		40	18.	7		11		2		3		15	7.	22		44		7
13		30		22	2.	56	9.	2		22		14	21.	54	14.	45	3.	52		44	18.	0		11
14		20		2		32		23		37		18		45		27		29	8.	7		16		15
15		9	12.	42		8		45		52		21		35		9		6		30		32		18
16	20.	58	12.	21	1.	45	10.	7	19.	6	23.	23	21.	26	13.	50	2.	43	8.	52	18.	47	23	21
17		46		0		21		28		20		25		16		31		19	9.	14	19.	1		24
18		34	11.	39	0.	57		49		34		27		5		11	1.	56		36		16		26
19		21		18		34	11.	10		47		28	20.	54	12.	51		33		58		30		27
20		9	10.	56		10		30	20.	0		29		43		32		9	10.	20		44		28
21	19.	56	10.	34	N.	14	11.	50	20.	12	23.	29	20.	32	12.	12	0.	45	10.	42	19.	57	23.	29
22		42		12	0.	37	12.	10		24		29		21	11.	52		22	11.	4	20.	10		29
23		28	9.	50	1.	1		30		36		28		10		32	S.	1		25		23		28
24		14		28		24		50		47		28	19.	58	11.	12	0.	25		45		35		27
25	18.	59		6		48	13.	10		58		27		45	10.	51		48	12.	5		47		26
26	18.	44	8.	44	2.	12	13.	29	21.	9	23.	25	19.	31	10.	30	1.	12	12.	26	20.	59	23.	24
27		29		21		35		48		19		23		18		9		35		47	21.	10		22
28		13	7.	58		58	14.	7		29		20		4	9.	48		59	13.	7		21		19
29	17.	56			3.	22		26		38		17	18.	50		27	2.	22		27		31		16
30		40				45		45		47		14		36		4		45		47		42		13
31		23			4.	8				56				21	8.	43			14.	7				9

A TABLE of the SUN's DECLINATION,

LEAP YEAR.

1780. 1784. 1788. 1792. 1796. 1800.

Days.	Jan.		Feb.		March		April		May		June		July		August		Sept.		Oct.		Nov.		Dec.	
	S.		S.		S.		N.		N.		N.		N.		N.		N.		S.		S.		S.	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
1	23.	3	17.	11	7.	18	4.	49	15.	17	22.	10	23.	7	17.	55	8.	5	3.	27	14.	41	21.	58
2	22.	58	16.	54	6.	55	5.	12		34		18		3		40	7.	43		50	15.	0	22.	7
3		52		36		32		35		52		25	22.	58		24		21	4.	13		19		15
4		46		18		9		57	16.	10		32		52		8	6.	59		36		37		23
5		40		0	5.	46	6.	20		27		39		47	16.	52		37		59		55		30
6	22.	33	15.	42	5.	23	6.	43	16.	44	22.	45	22.	41	16.	35	6.	14	5.	22	16.	13	22.	37
7		26		24	4.	59	7.	5	17.	0		51		34		18	5.	52		45		31		44
8		18		5		36		27		17		56		27		1		29	6.	8		49		50
9		10	14.	46		13		50		33	23.	1		20	15.	44		6		31	17.	6		56
10		1		27	3.	49	8.	12		48		6		13		26	4.	44		54		23	23.	1
11	21.	52	14.	7	3.	26	8.	34	18.	4	23.	10	22.	5	15.	8	4.	21	7.	17	17.	39	23.	6
12		42	13.	47		2		56		19		14	21.	56	14.	51	3.	57		39		55		11
13		33		27	2.	38	9.	18		34		17		47		33		34	8.	2	18.	11		15
14		23		7		15		39		48		20		38		14		11		24		27		18
15		12	12.	46	1.	51	10.	0	19.	2		22		29	13.	55	2.	48		47		42		21
16	21.	1	12.	26	1.	28	10.	21	19.	16	23.	24	21.	19	13.	36	2.	25	9.	9	18.	57	23.	23
17	20.	49		5		4		42		29		26		9		16		2		31	19.	12		25
18		37	11.	43	0.	40	11.	3		42		28	20.	58	12.	57	1.	38		53		26		27
19		25		22		16		24		55		28		47		37		15	10.	14		40		28
20		12		1	N.	7		45	20.	8		29		36		17	0.	52		36		54		29
21	19.	59	10.	40	0.	31	12.	5	20.	20	23.	29	20.	29	11.	57	0.	29	10.	57	20.	7	23.	29
22		45		18		55		26		32		29		13		37		5	11.	19		20		29
23		31	9.	56	1.	18		45		43		28		0		17	S.	19		40		32		28
24		17		34		41	13.	5		54		27	19.	48	10.	56	0.	42	12.	1		44		27
25		3		12	2.	5		25	21.	5		25		35		35	1.	6		21		56		25
26	18.	48	8.	49	2.	29	13.	44	21.	15	23.	23	19.	21	10.	14	1.	29	12.	42	21.	7	23.	22
27		32		27		52	14.	3		25		20		8	9.	53		53	13.	2		18		19
28		17		4	3.	15		22		35		18	18.	54		32	2.	16		22		29		16
29		1	7.	41		39		41		44		15		40		11		39		42		39		13
30	17.	45			4.	2		59		53		11		25	8.	49	3.	3	14.	2		48		9
31		18				25			22.	2				10		27				22				5

A
TABLE
OF
NATURAL SINES,
AND
SECANTS LESS RADIUS,
TO
EVERY MINUTE OF THE QUADRANT.

A TABLE of NATURAL SINES AND SECANTS LESS RADIUS.

	D. 0.				D. 1.				D. 2.				
M	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	M
0	0	0.00000	00000	0.00000	1745	0.00007	99985	1.75814	3497	0.00026	99939	5 45718	60
1	29	000	99599	3 53627	774	007	984	5097	519	027	938	5358	59
2	58	000	999	23524	803	007	984	4391	548	027	937	5001	58
3	87	000	999	05915	832	007	983	3696	577	028	936	4646	57
4	116	000	999	2.93421	862	008	983	3012	606	028	935	4295	56
5	145	000	999	83730	891	008	982	2339	635	029	934	3946	55
6	175	0.00000	99999	2.75812	1920	0.00008	99982	1.71676	3664	0.00029	99933	1.43600	54
7	204	000	999	69118	949	008	981	1023	693	030	932	3257	53
8	233	000	999	63318	978	009	980	0379	723	030	931	2916	52
9	262	000	999	58203	2007	009	980	69745	752	031	930	2579	51
10	291	000	999	53627	036	009	979	9121	781	031	929	2243	50
11	320	000	999	49488	065	009	979	8505	810	032	927	1911	49
12	349	0.00000	99999	2.45709	2094	0.00010	99978	1.67897	3839	0 00032	99926	1.41581	48
13	378	000	999	42233	123	010	977	7298	868	033	925	1253	47
14	407	000	999	39015	152	010	977	6708	897	033	924	0928	46
15	436	000	999	36018	181	010	976	6125	926	034	923	0605	45
16	465	000	999	33216	211	011	976	5550	953	034	922	0285	44
17	495	001	999	30583	240	011	975	4982	984	034	921	39967	43
18	524	0.00001	99999	2.28100	2269	0.00011	99974	1.64422	4013	0.00035	99919	1.39657	42
19	553	001	998	25752	298	011	974	3869	042	036	918	9338	41
20	582	001	998	23525	327	012	973	3322	071	036	917	9026	40
21	611	001	998	21406	356	012	972	2783	100	037	916	8718	39
22	640	001	998	19385	385	012	972	2250	129	037	915	8411	38
23	669	001	998	17455	414	013	971	1724	158	038	914	8106	37
24	698	0.00001	99998	2.15607	2443	0.00013	99970	1.61204	4188	0.00038	99912	1.37804	36
25	727	001	997	13834	472	013	969	0690	217	039	911	7503	35
26	756	001	997	12130	501	014	969	0182	246	039	910	7205	34
27	785	001	997	10490	530	014	968	59680	275	040	909	6909	33
28	814	001	997	08912	560	014	967	9183	304	040	907	6615	32
29	844	002	996	07388	589	015	966	8694	333	041	906	6322	31
30	873	0.00002	99996	2.05916	2618	0.00015	99966	1.58208	4362	0.00041	99905	1.36032	30
31	902	002	996	04492	647	015	965	7728	391	042	904	5744	29
32	931	002	996	03113	676	016	964	7254	420	042	902	5457	28
33	960	002	995	01777	705	016	963	6784	449	044	901	5173	27
34	989	002	995	00480	734	016	963	6320	478	044	900	4890	26
35	1018	002	995	1.99221	763	017	962	5861	507	044	898	4600	25
36	1047	0 00002	99995	1.97998	2792	0.00017	99961	1.55406	4536	0.00045	99897	1.34330	24
37	076	003	994	96808	821	017	960	4956	565	045	896	4053	23
38	105	003	994	95650	850	018	959	4511	594	046	894	3777	22
39	134	003	994	94522	879	018	959	4070	623	046	893	3507	21
40	164	003	993	93422	908	018	958	3634	653	047	892	3231	20
41	195	003	993	92350	938	019	957	3201	682	048	890	2961	19
42	1222	0.50003	99993	1,91304	2967	0 00019	99956	1.52774	4711	0.00048	99889	1.32692	18
43	251	003	992	90282	996	019	955	2350	740	049	888	2425	17
44	280	004	992	89283	3025	020	954	1931	769	049	886	2159	16
45	309	004	991	88307	054	020	953	1515	798	050	885	1896	15
46	338	004	991	87353	083	021	952	1104	827	051	883	1633	14
47	367	004	991	86419	112	021	952	0696	856	051	882	1373	13
48	1396	0.00004	99990	1.85505	3141	0.00021	99951	1.50292	4885	0.00052	99881	1.31114	12
49	425	004	990	84609	170	022	950	49892	924	052	879	0856	11
50	454	005	989	83732	199	022	949	9496	943	053	878	0600	10
51	483	005	989	82872	228	023	948	9103	972	054	876	0346	9
52	513	005	989	82029	257	023	947	8713	5001	054	875	0093	8
53	542	005	988	81202	286	023	946	8327	030	055	873	29841	7
54	1771	0.00005	99988	1.80390	3316	0.00024	99945	1.47945	5059	0,00056	99872	1.29591	6
55	600	006	987	79593	345	024	944	7566	088	056	870	9342	5
56	629	006	987	78811	374	025	943	7190	117	057	869	9095	4
57	658	006	986	78042	403	025	942	6817	146	058	867	8849	3
58	687	006	986	77287	432	026	941	6448	176	058	866	8605	2
59	716	006	985	76554	461	026	940	6081	205	059	864	8362	1
M			D. 89.				D. 88.				D. 87.		M

A TABLE of NATURAL SINES AND SECANTS LESS RADIUS.

	D. 3.				D. 4.				D. 5.				
M	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	M
0	5234	0.00060	99863	1.28120	6976	0.00106	99756	1.15642	8716	0.00166	99619	1.05970	60
1	263	60	861	7880	7005	107	754	461	745	167	617	826	59
2	292	61	860	7641	034	108	752	282	774	168	614	683	58
3	321	62	858	7403	063	109	750	104	853	169	612	539	57
4	350	62	857	7166	092	109	748	4925	831	170	609	397	56
5	379	63	855	6931	121	110	746	748	860	171	607	254	55
6	5408	0.00064	99854	1.2669-	7150	0.00111	99744	1.14571	8889	0.00172	99604	1.05113	54
7	437	64	852	6465	179	112	742	395	918	173	602	4971	53
8	466	65	850	6233	208	113	740	220	947	175	599	830	52
9	495	66	849	6003	237	114	738	045	976	176	596	690	51
10	524	66	847	5774	266	115	736	3872	9005	177	594	550	50
11	553	67	846	5546	295	116	734	699	034	178	591	411	49
12	5582	0.00068	99844	1.25320	7324	0.00117	99731	1.13526	9063	0.00179	99588	1.04272	48
13	611	68	842	5094	353	118	729	355	092	180	586	133	47
14	640	69	841	4870	382	119	727	184	121	181	583	3995	46
15	669	70	839	4647	411	120	725	013	150	183	580	857	45
16	698	71	838	4425	440	121	728	2844	179	184	578	720	44
17	727	71	836	4205	469	121	721	675	208	185	575	583	43
18	5756	0.00072	99834	1.23985	7498	0.00122	99719	1.12506	9237	0.00186	99572	1.03447	42
19	785	73	832	3766	527	123	716	338	266	187	570	311	41
20	814	74	831	3549	556	124	714	171	295	188	567	175	40
21	844	74	829	3333	585	125	712	005	324	190	564	040	39
22	873	75	827	3117	614	126	710	1839	353	191	562	2905	38
23	902	76	826	2903	643	127	708	674	382	192	559	771	37
24	5931	0.00077	99824	1.22690	7672	0,00128	99705	1.11510	9411	0.00193	99556	1.02637	36
25	960	77	822	2478	701	129	703	346	440	194	553	504	35
26	989	78	821	2267	730	130	701	183	469	196	551	371	34
27	6018	79	819	2057	759	131	699	020	498	197	548	238	33
28	047	80	817	1848	788	132	696	0858	527	198	545	106	32
29	076	80	815	1640	817	133	694	696	556	199	542	1974	31
30	6105	0.00081	99813	1.21432	7846	0.00134	99692	1.10536	9585	0.00200	99540	1.01843	30
31	134	82	812	1226	877	135	689	375	614	202	537	712	29
32	163	83	810	1021	904	136	687	216	642	203	534	581	28
33	192	83	808	0817	933	137	685	057	671	204	531	451	27
34	221	84	806	0614	962	138	683	09898	700	205	528	321	26
35	250	85	804	041	991	139	680	740	729	207	526	192	25
36	6279	0.00086	99803	1.20211	8020	0.00140	99678	1.09583	9758	0.00208	99523	1.01063	24
37	308	87	801	0010	049	141	676	426	787	209	520	0934	23
38	337	87	799	19811	078	142	673	270	816	210	517	806	22
39	366	88	797	9612	107	143	671	115	845	212	514	678	21
40	395	89	795	9415	136	144	668	8960	874	213	511	550	20
41	424	90	793	9218	165	145	666	805	903	214	508	423	19
42	6453	0.00091	99792	1.19022	8194	0.00146	99664	1.08651	9932	0,00215	99506	1.00296	18
43	482	91	790	8827	223	147	661	498	961	217	503	170	17
44	511	92	788	8633	252	148	659	345	990	218	500	044	16
45	540	93	786	8440	281	149	657	193	10019	219	497	0.99918	15
46	569	94	784	8248	310	150	654	041	048	220	494	793	14
47	598	95	782	8056	339	152	652	7890	077	222	491	668	13
48	6627	0.00096	99780	1.17866	8368	0.00153	99649	1.07759	10106	0.00223	99488	0.99544	12
49	656	96	778	7676	397	154	647	589	135	224	485	419	11
50	685	97	776	7487	426	155	644	439	164	225	482	296	10
51	714	98	774	7299	455	156	642	290	192	227	479	172	9
52	743	99	772	7112	484	157	639	141	221	228	476	049	8
53	773	100	770	6925	513	158	637	6993	250	229	473	8926	7
54	6802	0.00101	99768	1.16739	8542	0.00159	99635	1.06846	10279	0.00231	99470	0.98804	6
55	831	102	766	6554	571	160	632	699	308	232	467	682	5
56	860	102	764	6370	600	161	630	552	337	233	464	560	4
57	889	103	762	6187	629	162	627	406	366	235	461	439	3
58	918	104	760	6004	658	163	625	260	395	236	458	318	2
59	947	105	758	5823	687	164	622	115	424	237	455	197	1
M			D. 86.				D. 85.				D 84.		M

A TABLE of NATURAL SINES AND SECANTS LESS RADIUS.

	D. 6.				D. 7.				D. 8.				
M	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	M
0	10453	0.00239	99452	0.98077	12187	0.00325	99255	0.91411	13917	0.00425	99027	0.85644	60
1	482	240	449	7957	216	326	251	308	946	426	023	555	59
2	511	241	446	837	245	328	248	205	975	428	019	465	58
3	540	243	443	717	274	330	244	103	4004	430	015	376	57
4	569	244	440	598	302	331	240	001	033	432	011	286	56
5	597	245	437	480	331	333	237	0899	061	434	006	197	55
6	10626	0.00247	99434	0.97361	12360	0.00334	99233	0.90798	14090	0.00435	99002	0.85109	54
7	655	248	431	243	389	336	230	696	119	437	8998	020	53
8	684	249	428	126	418	337	226	595	148	439	994	4931	52
9	713	251	424	008	447	339	222	494	177	441	990	843	51
10	742	252	421	6891	476	341	219	394	205	443	986	755	50
11	771	253	418	774	504	342	215	293	234	444	982	667	49
12	10800	0.00255	99415	0.96658	12533	0.00344	99211	0.90193	14263	0.00446	98978	0.84579	48
13	829	256	412	542	562	345	208	0093	292	448	973	492	47
14	858	258	409	426	591	347	204	89994	320	450	969	404	46
15	887	259	406	310	620	349	200	894	349	452	965	317	45
16	916	260	403	195	649	350	197	795	378	454	961	230	44
17	945	262	399	080	678	352	193	696	407	455	957	143	43
18	10973	0.00263	99396	0.95966	12706	0.00353	99189	0.89598	14436	0.00457	98953	0.84056	42
19	11002	264	393	851	735	355	186	499	464	459	948	3970	41
20	031	266	390	738	764	357	182	401	493	461	944	884	40
21	060	267	386	624	793	358	178	303	522	463	940	797	39
22	089	269	383	510	822	360	175	205	551	465	936	711	38
23	117	270	380	397	851	362	171	107	580	467	931	626	37
24	11146	0,00272	99377	0.95285	12880	0.00363	99167	0.89010	14608	0.00468	98927	0.83540	36
25	175	273	374	172	908	365	163	8913	637	470	923	455	35
26	205	274	370	060	937	367	160	816	666	472	919	369	34
27	234	276	367	4948	966	368	156	719	695	474	914	284	33
28	263	277	364	836	995	370	152	623	723	476	910	199	32
29	291	279	360	725	3024	371	148	526	752	478	906	114	31
30	11320	0.00280	99357	0.94614	13053	0.00373	49144	0.88430	14781	0.00480	98902	0.83030	30
31	349	282	354	503	081	375	141	334	810	482	897	2945	29
32	378	283	351	393	110	376	137	239	838	483	893	861	28
33	407	284	347	283	139	378	133	143	867	485	889	777	27
34	436	286	344	173	168	380	129	048	896	487	884	693	26
35	465	287	341	063	197	382	125	7953	925	489	880	609	25
36	11494	0.00289	99337	0.93954	13226	0.00383	99122	0.87858	14954	0.00491	98876	0.82526	24
37	523	290	334	845	254	385	118	764	982	493	871	442	23
38	552	292	331	736	283	387	114	669	5011	495	867	359	22
39	580	293	327	628	312	388	110	575	040	497	863	276	21
40	609	295	324	519	341	390	106	481	069	499	858	193	20
41	638	296	320	411	370	392	102	388	097	501	854	110	19
42	11667	0.00298	99317	0.93304	13399	0.00393	99098	0.87294	15126	0.00503	98849	0.82027	18
43	696	299	314	196	427	395	094	201	155	505	845	1945	17
44	725	301	310	089	456	397	091	108	184	506	841	863	16
45	754	302	307	2982	485	399	087	015	212	508	836	780	15
46	783	304	303	876	514	400	083	6922	241	510	832	698	14
47	812	305	300	769	543	402	079	829	270	512	827	617	13
48	11840	0.00307	99297	0.92663	13572	0.00404	99075	0.86737	15299	0,00514	98823	0.81535	12
49	869	308	293	558	600	405	071	645	327	516	818	453	11
50	898	310	290	452	629	407	067	553	356	518	814	372	10
51	927	311	286	347	658	409	063	461	385	520	809	291	9
52	956	313	283	242	687	411	059	370	414	522	805	210	8
53	985	314	279	137	716	412	055	278	442	524	800	129	7
54	12014	0,00316	99276	0.92032	13744	0.00414	99051	0.86187	15471	0.00526	98796	0.81048	6
55	043	317	272	1928	773	416	047	096	500	528	791	0967	5
56	071	319	269	824	802	418	043	006	529	530	787	887	4
57	100	320	265	720	831	419	039	5915	557	532	782	807	3
58	129	322	262	617	860	421	035	825	586	534	778	727	2
59	158	323	258	514	888	423	031	738	615	536	773	647	1
M			D. 83.				D. 82.				D. 81.		M

A TABLE of NATURAL SINES AND SECANTS LESS RADIUS.

	D. 9.				D. 10.				D. 11.				
M	N. S.	S.L.R,	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	M
0	15643	0.00538	98769	0.80567	17365	0.00665	98481	0.76033	19081	0.0080	98163	0.71940	60
1	672	540	764	487	393	667	476	5961	109	80	157	875	59
2	720	542	760	428	422	669	471	890	138	810	152	810	58
3	730	544	755	328	451	672	466	819	167	813	146	746	57
4	758	546	751	249	479	674	460	747	195	815	140	681	56
5	787	548	746	170	508	676	455	676	224	818	135	616	55
6	15816	0.00550	98741	0.80091	17537	0.00678	98450	0.75605	19252	0.00820	98129	0.71552	54
7	845	552	737	012	565	681	445	534	281	823	124	488	53
8	873	554	732	79933	594	683	440	464	309	825	118	423	52
9	902	556	728	855	623	685	435	393	338	828	112	359	51
10	931	558	723	777	651	687	430	323	366	830	107	295	50
11	959	560	718	698	680	690	425	252	395	833	101	231	49
12	15988	0.00562	98714	0.79620	17708	0,00692	98420	0.75182	19423	0.00835	98096	0.71167	48
13	6017	564	709	542	737	694	414	112	452	838	090	104	47
14	046	566	704	465	766	696	409	042	481	840	084	040	46
15	074	568	700	387	794	699	404	4972	509	843	079	0976	45
16	103	571	695	309	823	701	399	902	538	845	073	913	44
17	132	573	690	232	852	703	394	832	566	848	067	850	43
18	16160	0.00575	98686	0.79155	17880	0.00706	98388	0.74763	19595	0.00850	98061	0.70786	42
19	189	577	681	078	909	708	383	693	623	853	056	723	41
20	218	579	676	001	937	710	378	624	652	855	050	660	40
21	246	581	671	8924	966	712	373	555	680	858	044	597	39
22	275	583	667	847	995	715	368	486	709	860	039	534	38
23	304	585	662	771	8023	717	362	417	737	863	033	471	37
24	16333	0.00587	98657	0.78694	18052	0.00719	98357	0.74348	19766	0.00865	98027	0.70409	36
25	361	589	652	618	081	722	352	279	794	868	021	346	35
26	390	591	648	542	109	724	347	210	823	870	016	284	34
27	419	593	643	466	138	726	341	142	851	873	010	221	33
28	447	596	638	390	166	729	336	073	880	876	004	159	32
29	476	598	633	315	195	731	331	005	908	878	7998	097	31
30	16505	0.00600	98629	0.78239	18224	0.00733	98325	0.73937	19937	0.00881	97992	0.70034	30
31	533	602	624	164	252	736	320	869	965	883	987	69972	29
32	562	604	619	088	281	738	315	801	994	886	981	910	28
33	591	606	614	013	309	740	310	733	20021	888	975	849	27
34	620	608	609	7938	338	743	304	665	051	891	969	787	26
35	648	610	604	863	367	745	299	597	079	894	963	725	25
36	16677	0.00612	98600	0.77789	18395	0.00748	98294	0.73530	20108	0.00896	97958	0.69664	24
37	706	615	595	714	424	750	288	462	136	899	952	602	23
38	734	617	590	639	452	752	283	395	165	901	946	541	22
39	763	619	585	565	481	755	277	328	193	904	940	479	21
40	792	621	580	491	509	757	272	261	222	907	930	418	20
41	820	623	575	417	538	759	267	194	250	909	928	357	19
42	16849	0.00625	98570	0.77343	18567	0.00762	98261	0.73127	20279	0.00912	97922	0.69296	18
43	878	628	565	269	595	764	256	060	307	914	916	235	17
44	906	630	561	195	624	767	250	2993	336	917	910	174	16
45	935	632	556	122	652	769	245	927	364	919	905	113	15
46	964	634	551	048	681	771	240	860	393	922	899	053	14
47	992	636	546	6975	710	774	234	794	421	925	893	8992	13
48	17021	0.00638	98541	0.76902	18738	0.00776	98229	0.72727	20450	0.00928	97887	0.68931	12
49	050	641	536	829	767	779	223	661	478	930	881	871	11
50	078	643	531	756	795	781	218	595	507	933	875	811	10
51	107	645	526	683	824	783	212	529	535	936	869	750	9
52	136	647	521	610	852	786	207	463	563	938	863	690	8
53	164	649	516	537	881	788	201	398	592	941	857	630	7
54	17193	0.00652	98511	0.76465	18910	0.00791	98196	0.72332	20620	0.00944	97851	0.68570	6
55	222	654	506	393	938	793	190	266	649	946	845	510	5
56	250	656	501	321	967	796	185	201	677	949	839	451	4
57	279	658	496	248	995	798	179	136	706	952	833	391	3
58	308	660	491	177	9024	800	174	070	734	954	827	331	2
59	336	663	486	105	052	803	168	005	763	957	821	271	1
M			D. 80.				D. 79.				D. 78.		M

A TABLE of NATURAL SINES AND SECANTS LESS RADIUS.

	D. 12.				D. 13.				D. 14.				
M	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	M
0	20791	0.00960	97815	0.68212	22495	0.01128	97437	0.64791	24192	0.01310	97030	0.61632	60
1	820	962	809	153	523	131	430	737	220	313	023	582	59
2	848	965	803	093	552	133	424	682	249	316	015	531	58
3	877	968	797	034	580	136	417	627	277	319	008	481	57
4	995	970	790	7975	608	139	411	573	305	322	001	430	56
5	933	973	784	916	637	142	404	519	333	325	6994	380	55
6	20962	0.00976	97778	0.67857	22665	0.01145	97398	0.64464	24361	0.01329	96987	0.61330	54
7	990	978	772	798	693	148	391	410	390	332	980	279	53
8	1019	981	766	739	722	151	384	356	418	335	973	229	52
9	047	984	760	681	750	154	378	302	446	338	966	179	51
10	076	987	754	622	778	157	371	248	474	341	959	129	50
11	104	989	748	563	807	160	365	194	503	344	952	079	49
12	21132	0.00992	97742	0.67505	22835	0.01163	97358	0.64140	24531	0.01348	96945	0.61029	48
13	161	995	735	446	863	166	351	086	559	351	937	0979	47
14	189	998	729	388	892	169	345	032	587	354	930	929	46
15	218	1000	723	330	920	172	338	3978	615	357	923	879	45
16	246	003	717	272	948	175	331	925	644	360	916	830	44
17	275	006	711	214	977	178	325	871	672	364	909	780	43
18	21303	0.01009	97705	0.67156	23005	0.01181	97318	0.63818	24700	0.01367	96902	0.60730	42
19	331	011	698	098	033	184	311	764	728	370	894	681	41
20	360	014	692	040	062	187	304	711	756	373	887	631	40
21	388	017	686	6982	090	190	298	658	784	377	880	582	39
22	417	020	680	925	118	193	291	605	813	380	873	533	38
23	445	022	673	867	146	196	284	551	841	383	866	483	37
24	21474	0.01025	97667	0.66810	23175	0.01199	97278	0.63498	24869	0.01386	96858	0.60434	36
25	502	028	661	752	203	202	271	445	897	390	851	385	35
26	530	031	655	695	231	205	264	392	925	393	844	336	34
27	559	033	648	638	260	208	257	340	953	396	837	287	33
28	587	036	642	580	288	211	251	287	982	399	829	238	32
29	616	039	636	523	316	214	244	234	5010	403	822	189	31
30	21644	0.01042	97630	0.66466	23345	0.01217	97237	0.63181	25038	0.01406	96815	0.60140	30
31	672	045	623	409	373	220	230	129	066	409	807	091	29
32	791	047	617	353	401	223	223	076	094	412	800	042	28
33	729	050	611	296	429	226	217	024	122	416	793	59994	27
34	758	053	604	239	458	229	210	2972	151	419	786	945	26
35	786	056	598	182	486	232	203	919	179	422	778	897	25
36	21814	0.01059	97592	0.66126	23514	0.01235	97196	0.62867	25207	0.01426	96771	0.59848	24
37	843	062	585	069	542	238	189	815	235	429	764	800	23
38	871	064	579	013	571	241	182	763	263	432	756	751	22
39	899	067	573	5957	599	244	176	711	291	435	749	703	21
40	928	070	566	900	627	247	169	659	320	439	742	654	20
41	956	073	560	844	656	250	162	607	348	442	734	606	19
42	21985	0.10076	97553	0.65788	23683	0.01254	97155	0.62555	25376	0.01445	96727	0.59558	18
43	2013	079	547	732	712	257	148	503	404	449	719	510	17
44	041	081	541	676	740	260	141	451	432	452	712	462	16
45	070	084	534	620	769	263	134	400	460	455	705	414	15
46	098	087	528	564	797	266	127	348	488	459	697	366	14
47	126	090	521	509	825	267	120	297	516	462	690	318	13
48	22155	0.01093	97515	0.65453	23853	0 01272	97113	0.62245	25545	0,01465	96682	0.59270	12
49	183	096	508	398	882	275	106	194	573	469	675	222	11
50	212	099	502	342	910	278	100	142	601	472	667	175	10
51	240	102	496	287	938	281	093	091	629	475	660	127	9
52	268	104	489	231	966	280	086	040	657	479	653	079	8
53	297	107	483	176	995	288	079	1989	685	482	645	032	7
54	22325	0.01110	97476	0.65121	24023	0.01291	97072	0.61938	25713	0,01485	96638	0.58984	6
55	354	113	470	066	051	294	065	887	741	489	630	937	5
56	382	116	463	011	079	297	058	836	769	492	623	889	4
57	410	119	457	4956	108	300	051	785	789	495	615	842	3
58	438	122	450	901	136	303	044	734	826	499	608	795	2
59	467	125	444	846	164	306	037	683	854	502	600	748	1
M			D. 77.				D. 76.				D. 75.		M

A TABLE of NATURAL SINES AND SECANTS LESS RADIUS.

M	D. 15.				D.16.				D. 17.				
M	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	M
0	25882	0.01506	96593	0.58700	27564	0.01716	96126	0.55966	29237	0.01940	95630	0.53406	60
1	910	509	585	653	592	719	118	922	265	944	622	365	59
2	938	512	578	606	620	723	110	878	293	948	613	323	58
3	966	516	570	559	648	727	102	834	321	952	605	283	57
4	994	519	562	512	676	730	094	790	348	956	596	242	56
5	6022	523	555	465	704	734	086	747	376	960	588	200	55
6	26050	0.01526	96547	0.58418	27731	0.01738	96078	0.55703	29404	0.01964	95575	0.53159	54
7	079	529	540	372	759	741	070	650	432	968	571	118	53
8	107	533	532	325	787	745	062	615	460	971	562	077	52
9	135	536	524	278	815	749	054	572	487	975	554	036	51
10	163	540	517	232	843	752	046	528	515	979	545	2995	50
11	191	543	509	185	871	756	037	484	543	983	536	955	49
12	26219	0.01547	96502	0.58139	27899	0.01760	96029	0.55441	29571	0.01987	95528	0.52914	48
13	247	550	494	092	927	763	021	398	599	991	519	873	47
14	275	553	486	046	955	767	013	354	626	995	511	832	46
15	303	557	479	7999	983	771	005	311	654	999	502	791	45
16	331	560	471	953	8011	774	5997	267	682	2003	493	751	44
17	359	564	463	907	039	778	989	224	710	007	485	710	43
18	26387	0.01567	96456	0.57860	28067	0.01782	59981	0.55181	29737	0.02011	95476	0.52670	42
19	415	571	448	814	095	785	972	138	765	014	467	629	41
20	443	574	440	768	123	789	964	095	793	018	459	589	40
21	471	578	433	722	150	793	956	052	821	022	450	548	39
22	500	581	425	676	278	796	948	008	849	026	441	508	38
23	528	585	417	630	206	800	940	4966	876	030	433	467	37
24	26556	0.01588	96410	0.57584	28234	0.01804	95931	0.54923	29904	0.02035	95424	0.52427	36
25	584	591	402	539	262	808	923	880	932	038	415	387	35
26	612	595	394	493	290	811	915	837	960	042	407	346	34
27	640	598	386	447	318	816	907	794	987	046	398	306	33
28	668	602	379	401	346	819	898	751	30015	050	389	266	32
29	696	605	371	356	374	823	890	708	043	054	380	226	31
30	26724	0.01609	96363	0.57310	28402	0.01826	95882	0.54666	30071	0.02058	95372	0.52186	30
31	752	612	355	265	419	830	874	623	098	062	363	146	29
32	780	616	347	219	457	834	865	581	126	066	354	106	28
33	808	619	340	174	485	838	857	538	154	070	345	066	27
34	836	623	332	128	513	841	849	496	182	074	337	026	26
35	864	627	324	083	541	845	841	453	209	078	328	1986	25
36	26892	0.01630	96316	0.57038	28569	0.01849	95832	0.54411	30237	0.02082	95319	0.51946	24
37	920	634	308	6992	597	853	824	368	265	086	310	906	23
38	948	637	301	947	625	856	816	326	292	090	301	867	22
39	976	641	293	902	652	860	807	284	320	094	293	827	21
40	7004	644	285	857	680	864	799	241	348	098	284	787	20
41	032	648	277	812	708	868	791	199	376	102	275	748	19
42	27060	0.01651	96269	0.56767	28736	0.01871	95782	0.54157	30403	0,02106	95266	0.51708	18
43	088	655	261	722	764	875	774	115	431	110	257	668	17
44	116	658	253	677	792	879	766	073	459	114	248	629	16
45	144	662	246	633	820	883	757	931	486	118	240	589	15
46	172	666	238	588	848	887	749	3989	514	222	231	550	14
47	200	669	230	543	875	890	740	947	542	126	222	510	13
48	27228	0.01673	96222	0.56498	28903	0.01894	95732	0.53905	30570	0.02130	95213	0.51471	12
49	256	676	214	454	931	898	724	863	597	134	204	432	11
50	284	680	206	409	959	902	715	822	625	139	195	393	10
51	312	683	198	365	987	906	707	780	653	143	186	353	9
52	340	687	190	320	9015	910	698	738	680	147	177	314	8
53	368	691	182	276	042	913	690	697	708	151	168	275	7
54	27396	0.01694	96174	0.56231	29070	0.01917	95681	0.53655	30736	0.02155	95159	0.51236	6
55	424	698	166	187	098	921	673	614	763	159	151	197	5
56	452	701	158	143	126	925	664	572	791	163	142	158	4
57	480	705	150	099	154	929	656	531	819	167	133	119	3
58	508	709	142	054	182	933	647	489	846	171	124	080	2
59	536	712	134	010	209	936	639	448	874	175	115	041	1
M			D. 74.				D. 73.				D 72.		M

A TABLE of NATURAL SINES AND SECANTS LESS RADIUS.

	D. 18.				D. 19.				D. 20.				
M	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	M
0	30902	0.02179	95106	0.51002	32557	0.02433	94552	0.48736	34202	0.02701	93969	0.46595	60
1	929	183	097	0963	584	437	542	699	229	706	959	560	59
2	957	188	088	924	612	442	533	663	257	711	949	525	58
3	985	192	075	887	639	446	523	626	284	715	939	491	57
4	1012	196	070	847	667	450	514	589	311	720	929	456	56
5	040	200	061	808	694	455	504	553	339	724	919	422	55
6	31068	0.02204	95052	0.50769	32722	0.02459	94495	0.48516	34366	0.02729	93909	0.46387	54
7	095	208	043	731	749	464	485	480	393	734	895	353	53
8	123	212	033	692	777	468	476	443	421	738	889	318	52
9	151	216	024	653	804	472	466	406	448	743	879	284	51
10	178	221	015	615	832	477	457	371	475	748	869	249	50
11	206	225	006	576	859	481	447	334	503	752	859	215	49
12	31233	0.02239	94997	0.50538	32887	0.02485	94438	0.48298	34530	0.02757	93849	0.46181	48
13	261	233	988	500	914	490	428	262	557	762	839	147	47
14	289	237	979	461	942	494	418	226	584	766	829	112	46
15	316	241	970	423	969	499	409	189	612	771	819	078	45
16	344	246	961	385	997	503	399	153	639	776	809	043	44
17	372	250	952	346	3024	508	390	117	666	780	799	009	43
18	31399	0.02254	94943	0.50308	33051	0.02512	94380	0.48081	34694	0.02785	93789	0.45975	42
19	427	258	933	270	079	516	370	045	721	790	779	941	41
20	454	262	924	232	106	521	361	009	748	794	769	907	40
21	482	266	915	194	134	525	351	7973	775	799	759	873	39
22	510	271	906	156	161	530	342	937	803	804	748	839	38
23	537	275	897	118	189	534	332	901	830	808	738	805	37
24	31565	0.02279	94888	0.50080	33216	0.02539	94322	0.47865	34857	0.02813	93728	0.45771	36
25	593	283	878	042	244	543	313	821	884	818	718	737	35
26	620	287	869	004	271	547	303	798	912	822	708	703	34
27	648	292	860	49966	298	552	293	758	939	827	698	669	33
28	675	296	851	928	326	556	284	736	966	832	688	635	32
29	703	300	842	890	353	561	274	686	993	837	677	601	31
30	31730	0.02304	94832	0.49852	33381	0.02565	94264	0.47650	35021	0.02841	93667	0.45567	30
31	758	309	823	815	408	570	254	615	048	846	657	534	29
32	786	313	814	777	436	574	245	579	075	851	647	500	28
33	813	317	805	739	463	579	235	544	102	855	637	466	27
34	841	321	795	702	490	583	225	508	130	860	626	433	26
35	868	326	786	664	518	588	215	473	157	865	616	395	25
36	31896	0.02330	94777	0.49626	33545	0.02592	94206	0.47437	35184	0.02870	93606	0.45365	24
37	923	334	768	589	573	597	196	402	211	874	596	332	23
38	951	338	758	551	600	601	186	366	239	879	585	298	22
39	979	343	749	514	627	606	176	331	266	884	575	265	21
40	2006	347	740	477	655	610	167	295	293	889	565	231	20
41	034	351	730	439	682	615	157	260	320	893	555	198	19
42	32061	0.02355	94721	0.49402	33710	0.02619	94147	0.47225	35347	0.02898	93544	0.45164	18
43	089	360	712	365	737	624	137	189	375	903	534	131	17
44	116	364	702	327	764	628	127	154	402	908	524	097	16
45	144	368	693	290	792	633	118	119	429	913	514	064	15
46	171	372	684	253	819	637	108	084	456	917	503	031	14
47	199	377	674	216	846	642	098	049	483	922	493	4997	13
48	32227	0.02381	94665	0.49179	33874	0.02647	94088	0.47014	35511	0.02927	93483	0.44964	12
49	254	385	656	142	901	651	078	6979	538	932	472	931	11
50	282	390	646	104	929	656	068	944	565	937	462	898	10
51	309	394	637	067	956	660	058	908	592	941	452	864	9
52	337	398	628	030	983	665	049	874	619	946	441	831	8
53	364	403	618	8993	4011	669	039	839	647	951	431	798	7
54	32392	0.02407	94609	0.48957	34038	0.02674	94029	0.46804	35674	0.02956	93420	0.44765	6
55	419	411	599	920	065	678	019	769	701	961	410	732	5
56	447	416	590	883	093	683	009	734	728	965	400	699	4
57	474	420	580	846	120	688	3999	699	755	970	389	666	3
58	502	424	571	809	147	692	989	664	782	975	379	633	2
59	529	429	561	773	175	697	979	630	810	980	368	600	1
M			D. 71.				D. 70.				D. 69.		M

A TABLE of NATURAL SINES AND SECANTS LESS RADIUS.

	D. 21.				D. 22.				D. 23.				
M	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	M
0	35837	0.02985	93358	0.44567	37461	0.03283	92718	0.42642	39073	0.03597	92050	0.40812	60
1	864	990	348	534	488	289	707	611	099	603	039	782	59
2	891	995	337	501	515	294	697	580	127	608	028	753	58
3	918	999	327	468	542	299	686	549	153	613	016	723	57
4	945	3004	316	436	569	304	675	518	180	619	005	693	56
5	973	009	306	403	595	309	664	486	207	624	1994	664	55
6	36000	0.03014	93295	0.44370	37622	0.03314	92653	0.42455	39234	0.03630	91982	0.40634	54
7	027	019	285	337	649	319	642	424	260	635	971	604	53
8	054	024	274	305	676	324	631	393	287	640	959	575	52
9	081	029	264	272	703	330	620	362	314	646	948	545	51
10	108	034	253	239	730	335	609	331	341	651	936	516	50
11	135	038	243	207	757	340	598	300	367	657	925	486	49
12	36162	0.03043	93232	0.44174	37784	0.03345	92587	0.42269	39394	0.03662	91914	0.40457	48
13	190	048	222	142	811	350	576	238	421	667	902	437	47
14	217	053	211	109	838	355	565	207	448	673	891	398	46
15	244	058	201	077	865	360	554	176	474	678	879	368	45
16	271	063	190	044	892	366	543	145	501	684	868	339	44
17	298	068	180	012	919	371	532	115	528	689	856	310	43
18	36325	0.03073	93169	0.43979	37946	0.03376	92521	0.42084	39555	0.03695	91845	0.40280	42
19	352	078	159	947	973	381	510	053	581	700	833	251	41
20	379	083	148	915	999	386	499	022	608	706	822	222	40
21	406	088	137	882	8026	392	488	1992	635	711	810	192	39
22	434	093	127	850	053	397	477	961	661	716	799	163	38
23	461	007	116	818	080	401	466	930	688	722	787	134	37
24	36488	0.03102	93106	0.43785	38107	0.03407	92455	0.41899	39715	0.03727	91775	0.40105	36
25	515	107	095	753	134	412	444	869	741	733	764	076	35
26	542	112	084	721	161	418	432	838	768	738	752	046	34
27	569	117	074	689	188	423	421	808	795	744	741	017	33
28	596	122	063	657	215	428	410	777	822	749	729	39988	32
29	623	127	052	623	241	433	399	747	848	755	718	959	31
30	36650	0.03132	93042	0.43592	38268	0.03438	92388	0.41716	39875	0.03760	91706	0.39930	30
31	677	137	031	560	295	444	377	686	902	766	694	901	29
32	704	142	020	528	322	449	366	655	928	771	683	872	28
33	731	147	010	496	349	454	355	624	955	777	671	843	27
34	758	152	2999	464	376	459	343	594	982	782	660	814	26
35	785	157	988	432	403	465	332	564	40008	788	648	785	25
36	36812	0.03162	92978	0.43401	38430	0.03470	92321	0.41533	40035	0.03793	91636	0.39756	24
37	839	167	967	369	456	475	310	503	062	799	625	727	23
38	867	172	956	337	483	480	299	473	088	804	613	698	22
39	894	177	945	305	510	486	287	443	115	810	601	669	21
40	921	182	935	273	537	491	276	412	142	815	590	641	20
41	948	187	924	241	564	496	265	382	168	821	578	612	19
42	36975	0.03192	92913	0.43210	38591	0.03502	92254	0.41352	40195	0.03826	91566	0.39583	18
43	7002	197	902	178	617	507	243	322	221	832	555	554	17
44	029	202	892	146	644	512	231	291	248	838	543	526	16
45	056	207	881	114	671	517	220	261	275	843	531	497	15
46	083	212	870	083	698	523	209	231	301	849	519	468	14
47	110	217	859	051	725	528	198	201	328	854	508	439	13
48	37134	0.03222	92849	0.43020	38752	0.03533	92186	0.41171	40355	0.03860	91496	0.39411	12
49	164	228	838	2988	778	539	175	141	381	865	484	382	11
50	191	233	827	956	805	544	164	111	408	871	472	354	10
51	218	238	816	925	832	549	152	081	434	877	461	325	9
52	245	243	805	893	859	555	141	051	461	882	449	296	8
53	272	248	794	862	886	560	130	021	488	888	437	269	7
54	37299	0.03253	92784	0.42831	38912	0.03566	92119	0,40991	40514	0.03893	91425	0.39239	6
55	326	258	773	799	939	571	107	961	541	899	414	211	5
56	353	263	762	768	966	576	096	931	567	905	402	182	4
57	380	268	751	736	993	581	085	902	594	910	390	154	3
58	407	273	740	705	9020	587	073	872	621	916	378	12	2
59	434	278	729	674	046	592	062	842	647	921	366	007	1
M			D. 68.				D. 67.				D 66.		M

A TABLE of NATURAL SINES AND SECANTS LESS RADIUS.

	D. 24.				D. 25.				D. 26.				
M	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	M
0	40674	0.03927	91355	0.35069	42262	0.04272	90631	0.37405	43837	0.04634	89879	0.35816	60
1	700	933	343	040	288	278	618	378	863	640	867	790	59
2	727	938	331	012	315	284	606	351	889	646	854	764	58
3	753	945	319	8984	341	280	594	324	916	652	841	738	57
4	780	950	307	955	367	296	582	297	942	659	828	712	56
5	806	955	295	927	394	302	569	270	968	665	816	687	55
6	40833	0.03961	91283	0.38899	42420	0.04308	90557	0.37243	43994	0.04671	89803	0.35661	54
7	860	966	272	871	446	314	545	216	4020	677	790	635	53
8	886	972	260	842	473	320	532	189	046	683	777	609	52
9	913	978	248	814	499	326	520	162	072	690	764	583	51
10	939	983	236	786	525	332	507	135	098	696	752	557	50
11	966	989	224	758	552	337	495	198	124	702	739	532	49
12	40992	0.03995	91212	0.38730	42578	0.04343	90483	0.37082	44151	0.04708	89726	0.35506	48
13	1019	4000	200	702	604	349	470	005	177	714	713	481	47
14	045	006	188	674	631	355	458	028	203	721	700	455	46
15	072	012	176	646	657	361	446	001	229	727	687	429	45
16	098	018	164	618	683	367	433	6974	255	733	674	404	44
17	125	023	152	589	709	373	421	948	281	739	662	378	43
18	41151	0.04029	91140	0.38562	42736	0.04379	90408	0.36921	44307	0.04746	89649	0.35353	42
19	178	035	128	534	762	385	396	894	333	752	636	327	41
20	204	040	116	506	788	391	383	867	359	758	623	302	40
21	231	046	104	478	815	497	371	841	385	764	610	276	39
22	257	052	092	450	841	403	358	814	411	771	597	251	38
23	284	058	080	422	867	409	346	787	437	777	584	225	37
24	41310	0.04063	91068	0.38394	42894	0.04415	90334	0.36761	44464	0.04783	89571	0.35200	36
25	337	069	056	366	920	421	321	734	490	789	558	174	35
26	363	075	044	338	946	427	309	708	516	796	545	149	34
27	390	080	032	311	972	433	296	681	542	802	532	123	33
28	416	086	020	283	999	439	284	655	568	808	519	098	32
29	443	092	008	255	3025	445	271	628	594	815	506	073	31
30	41469	0.04098	90996	0.38227	43051	0.04451	90259	0.36602	44620	0.04821	89493	0.35047	30
31	496	103	984	200	077	457	246	575	646	827	480	022	29
32	522	109	972	172	104	463	233	549	672	833	467	4997	28
33	549	115	960	144	130	469	221	522	698	840	454	971	27
34	575	121	948	117	156	475	208	497	724	846	441	946	26
35	602	127	036	089	182	481	196	469	750	852	428	921	25
36	41628	0.04132	90924	0.38061	43209	0.04487	90183	0.36443	44776	0.04859	89415	0.34896	24
37	655	138	912	034	235	493	171	417	802	865	402	870	23
38	681	144	899	006	261	500	158	390	828	871	389	845	22
39	707	150	887	7979	287	506	146	364	854	878	376	820	21
40	734	156	875	951	313	512	133	338	880	884	363	795	20
41	760	161	863	924	340	518	120	311	906	890	350	770	19
42	41787	0.04167	90851	0.37896	43366	0.04524	90108	0.36285	44932	0.04897	89337	0.34745	18
43	813	173	839	869	392	530	095	259	958	903	324	719	17
44	840	179	826	841	418	536	082	233	984	910	311	694	16
45	869	185	814	814	445	542	070	206	5010	916	298	669	15
46	892	190	802	786	471	548	057	180	039	922	285	644	14
47	919	196	790	759	497	554	045	154	062	929	272	619	13
48	41945	0.04202	90778	0.37732	43523	0.04560	90032	0.36128	45088	0.04935	89259	0.34594	12
49	972	208	766	704	549	566	019	102	114	941	245	569	11
50	998	214	753	677	575	573	007	076	140	948	232	544	10
51	2024	220	741	650	602	579	89994	050	166	954	219	519	9
52	051	225	729	623	628	585	981	024	192	961	206	494	8
53	077	231	717	595	654	591	968	5998	218	967	193	469	7
54	42104	0.04237	90704	0.37568	43680	0.04597	89956	0.35972	45243	0.04973	89180	0.34444	6
55	130	243	692	541	706	603	943	946	269	980	167	420	5
56	156	249	680	514	733	609	930	920	295	986	153	395	4
57	183	255	668	487	759	616	918	894	321	993	140	370	3
58	209	261	655	459	785	622	905	868	347	999	127	345	2
59	235	267	643	432	811	628	892	842	373	5005	114	320	1
M			D. 65.				D. 64.				D. 63.		M

A TABLE of NATURAL SINES AND SECANTS LESS RADIUS.

	D. 27.				D. 28.				D. 29.				
M	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	M
0	45399	0.05012	89101	0.34295	46947	0.05407	88295	0.32839	48481	0.05818	87462	0.31443	60
1	425	018	087	271	973	413	281	815	506	825	448	420	59
2	451	025	074	246	999	420	267	792	532	832	438	397	58
3	477	031	061	221	7024	427	254	768	557	839	420	375	57
4	503	038	048	196	050	433	240	744	583	846	405	352	56
5	529	044	035	172	076	440	226	720	608	853	391	329	55
6	45554	0.05051	89021	0.34147	47101	0.05447	88213	0.32697	48634	0.05860	87377	0.31306	54
7	580	057	008	122	127	454	199	673	659	867	363	284	53
8	606	064	8995	098	152	460	185	650	684	874	349	261	52
9	632	070	981	073	178	467	172	626	710	881	335	238	51
10	658	077	968	048	204	474	158	602	735	888	321	216	50
11	684	083	955	024	229	481	144	679	761	895	306	193	49
12	45710	0.05089	88942	0.33999	47255	0.05487	88130	0.32555	48786	0.05902	87292	0.31170	48
13	736	096	928	975	281	494	117	532	811	910	278	148	47
14	762	102	915	950	306	501	103	508	837	917	264	125	46
15	787	109	902	925	332	508	089	485	862	924	250	103	45
16	813	115	888	901	358	515	075	461	887	931	235	080	44
17	839	122	875	876	383	521	062	438	913	938	221	058	43
18	45865	0.05129	88862	0.33852	47409	0.05528	88048	0.32414	48938	0.05945	87207	0.31035	42
19	891	135	848	827	434	535	034	391	964	952	193	013	41
20	917	142	835	803	460	542	028	367	989	959	178	0990	40
21	942	148	822	779	486	549	006	344	9014	966	164	968	39
22	978	155	808	754	511	555	7993	320	040	973	150	945	38
23	994	161	795	730	537	562	979	297	065	980	136	923	37
24	46020	0.05168	88782	0.33705	47562	0.05569	87965	0.32274	49090	0.05988	87121	0.30900	36
25	046	174	768	681	588	576	951	250	116	995	107	878	35
26	072	181	755	657	614	583	937	227	141	6002	093	856	34
27	097	187	741	632	639	590	923	204	166	009	079	833	33
28	123	194	728	608	665	596	909	180	192	016	064	811	32
29	149	201	715	584	690	603	896	157	217	023	050	788	31
30	46175	0.05207	88701	0.33559	47716	0.05610	87882	0.32134	49242	0.06030	87036	0.30766	30
31	201	214	688	535	741	617	868	110	268	037	021	744	29
32	226	220	674	511	767	624	854	087	293	045	007	721	28
33	252	227	661	487	793	631	840	064	318	052	6993	699	27
34	276	233	647	463	818	638	826	041	344	059	978	677	26
35	304	240	634	438	844	645	812	018	369	066	964	655	25
36	46330	0.05247	88620	0.33414	47869	0.05651	87798	0.31994	49394	0.06073	86949	0.30632	24
37	355	253	607	390	895	658	784	971	419	080	935	610	23
38	381	260	593	366	920	665	770	948	445	088	921	588	22
39	407	266	580	342	946	672	756	925	470	095	906	566	21
40	433	273	566	318	971	679	743	902	495	102	892	544	20
41	458	280	553	294	997	686	729	879	522	109	878	521	19
42	46484	0.05286	88539	0.33269	48022	0.05693	87715	0.31856	49546	0.06116	86863	0.30499	18
43	510	293	526	245	048	700	701	833	571	124	849	477	17
44	536	300	512	221	073	707	687	810	596	131	834	455	16
45	561	306	499	197	099	714	673	787	622	138	820	433	15
46	587	313	485	173	124	721	659	763	647	145	805	411	14
47	613	320	472	140	150	727	645	740	672	153	791	389	13
48	46639	0.05326	88458	0.33125	48175	0.05734	87631	0.31717	49697	0.06160	86777	0.30367	12
49	664	333	445	101	201	741	617	695	723	167	762	345	11
50	690	340	431	078	226	748	603	672	748	174	748	323	10
51	716	346	417	054	252	755	589	649	773	181	733	301	9
52	742	353	404	030	277	762	575	626	798	189	719	279	8
53	767	360	390	006	303	769	560	603	824	196	704	257	7
54	46793	0.05366	88377	0.32982	48328	0.05776	87546	0.31580	49849	0.06203	86690	0.30235	6
55	819	373	363	958	354	783	532	557	874	211	675	213	5
56	844	380	349	934	379	790	518	534	899	218	661	191	4
57	870	386	336	910	405	797	504	511	924	225	646	169	3
58	896	393	322	887	430	804	490	488	950	232	632	147	2
59	921	400	308	863	456	811	476	466	975	240	617	125	1
M			D. 62.				D. 61.				D. 60.		M

A TABLE of NATURAL SINES AND SECANTS LESS RADIUS.

	D. 30.				D. 31.				D. 32.				
M	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	M
0	50000	0.06247	86603	0.30103	51504	0.06693	85717	0.28816	52992	0.07158	84805	0.27579	60
1	025	254	588	081	529	761	702	795	53017	166	789	559	59
2	056	262	573	059	554	709	687	774	041	174	774	539	58
3	076	264	559	037	579	716	672	753	066	182	759	519	57
4	101	276	544	016	604	724	657	732	091	190	743	498	56
5	126	283	530	29994	628	731	642	711	115	197	728	478	55
6	50151	0.06291	86515	0.29972	51653	0.06739	85627	0.28690	53140	0.07205	84713	0.27458	54
7	176	298	501	950	678	747	612	669	165	213	697	438	53
8	201	305	486	928	703	754	597	648	189	221	681	418	52
9	227	313	471	907	728	762	582	627	214	229	666	398	51
10	252	320	457	895	753	770	567	607	238	237	650	378	50
11	277	327	442	863	778	777	551	586	263	245	635	357	49
12	50302	0.06335	86427	0.29841	51803	0.06785	85536	0.28565	53288	0.07253	84619	0.27337	48
13	327	342	413	820	828	793	521	544	312	261	604	317	47
14	352	350	398	798	852	800	506	523	337	269	588	297	46
15	377	357	384	776	877	808	491	502	361	277	573	277	45
16	403	364	369	755	902	816	476	481	386	285	557	257	44
17	428	372	354	733	927	823	461	461	411	293	542	237	43
18	50453	0.06379	86340	0.29712	51952	0.06831	85446	0.28440	53435	0.07301	84526	0.27217	42
19	478	386	325	690	977	839	431	419	460	309	511	197	41
20	503	394	310	663	2002	846	416	398	484	317	495	177	40
21	528	401	295	647	026	854	401	378	509	325	480	157	39
22	553	409	281	625	051	862	385	367	534	333	464	137	38
23	578	416	266	604	076	869	370	336	558	341	448	117	37
24	50603	0.06423	86251	0.29582	52101	0.06877	85355	0.28315	53583	0.07349	84433	0.27098	36
25	628	431	237	561	126	885	340	295	607	357	417	078	35
26	654	438	222	539	151	892	325	274	632	365	402	058	34
27	679	446	207	518	175	900	310	253	656	373	386	038	33
28	704	453	192	496	200	908	294	233	681	381	370	018	32
29	729	461	178	475	225	916	279	212	705	389	355	26998	31
30	50754	0.06468	86163	0.29453	52250	0.06923	85264	0.28191	53730	0.07397	84339	0.26978	30
31	779	475	148	432	275	931	249	171	754	405	324	959	29
32	804	483	133	410	299	939	234	160	779	413	308	939	28
33	829	490	119	389	324	947	218	130	804	421	292	919	27
34	854	498	104	367	349	954	203	109	828	429	277	899	26
35	879	505	089	346	374	962	188	089	853	437	261	879	25
36	50904	0.06513	86074	0.29325	52399	0.06970	85173	0.28068	53877	0.07445	84245	0.26860	24
37	929	520	059	303	423	978	157	048	902	454	230	840	23
38	954	528	045	282	448	986	142	027	926	462	214	820	22
39	979	535	030	261	473	993	127	006	950	470	198	800	21
40	1004	543	015	239	498	7001	112	27986	975	478	182	781	20
41	029	550	000	218	522	009	096	966	54000	486	167	761	19
42	51054	0.06558	85985	0.29197	52547	0.07017	85081	0.27945	54024	0.07494	84151	0.26741	18
43	079	565	970	176	572	024	066	925	049	502	135	722	17
44	104	573	956	154	597	032	051	904	073	510	120	702	16
45	129	580	941	133	621	040	035	884	097	518	104	682	15
46	154	588	926	112	646	048	020	863	122	527	088	663	14
47	179	595	911	091	671	056	005	843	146	535	072	643	13
48	51204	0.06603	85896	0.29069	52696	0.07064	84989	0.27823	54171	0.07543	84057	0.26623	12
49	229	610	881	048	720	071	974	802	195	551	041	604	11
50	254	618	866	027	745	079	959	782	220	559	025	584	10
51	279	625	851	006	770	087	943	762	244	567	009	565	9
52	304	633	836	8985	794	095	928	741	269	575	83994	545	8
53	329	640	821	964	819	103	913	721	293	583	987	526	7
54	51354	0.06648	85806	0.28942	52844	0.07111	84897	0.27701	54317	0.07592	83962	0.26506	6
55	379	656	792	921	869	119	882	680	342	600	946	487	5
56	404	663	777	900	893	126	866	660	366	608	930	467	4
57	429	671	762	879	918	134	851	640	391	616	915	448	3
58	454	678	747	858	943	142	836	619	415	624	899	428	2
59	479	686	732	837	967	150	820	599	439	633	883	409	1
M			D. 59.				D. 58.				D. 57.		M

A TABLE of NATURAL SINES AND SECANTS LESS RADIUS.

	D. 33.				D. 34.				D. 35.				
M	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	M
0	54464	0.07641	83867	0.26389	55919	0.08143	82904	0.25244	57358	0.08664	81915	0.24142	60
1	488	649	851	370	943	151	887	225	381	672	899	123	59
2	513	657	835	350	968	160	871	206	405	681	882	105	58
3	537	665	820	331	992	168	855	188	429	690	865	087	57
4	561	674	804	311	56016	177	839	169	453	698	848	069	56
5	586	682	788	292	040	185	822	150	477	708	832	051	55
6	54610	0.07690	83772	0.26273	56064	0.08194	82806	0.25132	57501	0.08717	81815	0.24033	54
7	635	698	756	253	088	202	790	113	524	726	798	015	53
8	659	707	740	234	112	211	773	094	548	734	781	23997	52
9	683	715	724	215	136	219	757	076	572	743	765	979	51
10	708	723	708	195	160	228	741	057	596	752	748	961	50
11	732	731	692	176	184	237	724	039	619	761	731	943	49
12	54756	0.07740	83676	0.26157	56208	0.08245	82708	0.25020	57643	0.08770	81714	0.23925	48
13	781	748	660	137	232	254	692	001	667	779	698	907	47
14	805	756	645	118	256	262	675	4983	691	788	680	889	46
15	829	765	629	099	280	271	659	964	715	797	664	871	45
16	854	773	613	079	305	280	643	946	738	806	647	854	44
17	878	781	597	060	329	288	626	927	762	815	631	836	43
18	54902	0.07789	83581	0.26041	56353	0.08297	82610	0.24909	57786	0.08824	81614	0.23818	42
19	927	798	565	022	377	305	593	890	809	833	597	800	41
20	951	806	549	003	401	314	577	872	833	842	580	782	40
21	975	814	533	5983	425	323	561	853	857	850	563	764	39
22	999	823	517	964	449	331	544	835	881	859	546	747	38
23	5024	831	501	945	473	340	528	816	904	868	530	729	37
24	55048	0.07839	83485	0.25926	56497	0.08349	82511	0.24798	57928	0.08877	81513	0.23711	36
25	072	848	469	907	521	357	495	779	952	886	496	693	35
26	097	856	453	887	545	366	478	761	976	895	479	676	34
27	121	864	437	868	569	375	462	742	999	904	462	658	33
28	145	873	421	849	593	383	446	724	8023	913	445	640	32
29	169	881	405	830	617	392	429	706	047	922	428	622	31
30	55194	0.07889	83389	0.25811	56641	0.08401	82413	0.24687	58070	0.08931	81412	0.23605	30
31	218	898	373	792	665	409	396	669	094	940	395	587	29
32	242	906	356	773	689	418	380	650	117	949	378	569	28
33	266	914	340	754	713	427	363	632	141	958	361	552	27
34	291	923	324	735	736	435	347	614	165	967	344	534	26
35	315	931	308	716	760	444	330	595	198	977	327	516	25
36	55339	0.07940	83292	0.25697	56784	0.08453	82314	0.24577	58212	0.08986	81310	0.23499	24
37	363	948	276	678	808	462	297	559	236	995	293	481	23
38	388	956	260	659	832	470	281	541	260	9004	276	463	22
39	412	985	244	640	856	479	264	522	283	013	259	446	21
40	436	973	228	621	880	488	248	504	307	022	242	428	20
41	460	982	212	602	804	496	231	486	330	031	225	410	19
42	55484	0.07990	83195	0.25583	56928	0.08505	82214	0.24467	58354	0.09040	81208	0.23393	18
43	509	998	179	564	952	514	198	449	378	049	191	375	17
44	533	8007	163	545	976	523	101	431	401	058	174	358	16
45	557	015	147	546	57000	531	165	413	425	067	157	340	15
46	581	024	131	507	024	540	147	395	449	076	140	323	14
47	605	032	115	488	047	549	131	376	472	085	123	305	13
48	55630	0.08041	83098	0.25469	57071	0.08558	82115	0.24358	58496	0.09094	81106	0.23288	12
49	654	049	082	451	095	567	098	340	519	104	089	270	11
50	678	058	066	432	119	575	082	322	543	113	072	253	10
51	702	066	050	413	143	584	065	304	567	122	055	235	9
52	726	075	034	394	167	593	048	286	590	131	038	218	8
53	750	083	017	375	191	602	032	267	614	140	021	200	7
54	55775	0.08092	83001	0.25356	57215	0.08611	82015	0.24249	58637	0.09149	81004	0.23183	6
55	799	100	2985	338	238	619	1999	231	661	158	80987	165	5
56	823	109	969	319	262	628	982	213	684	168	970	148	4
57	847	117	953	300	286	637	965	195	708	177	953	130	3
58	871	126	936	281	310	646	949	177	731	186	936	113	2
59	895	134	920	263	334	655	932	159	755	195	919	096	1
M			D. 56.				D. 55.				D. 54.		M

A TABLE of NATURAL SINES AND SECANTS LESS RADIUS.

	D. 36.				D. 37.				D. 38.				
M	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	M
0	58779	0,09204	80902	0.23078	60181	0.09765	79864	0,22054	61566	0.10347	78801	0.21066	60
1	802	213	885	061	205	775	846	037	589	357	783	050	59
2	826	223	867	043	228	784	829	020	612	367	765	033	58
3	849	232	850	026	251	794	811	003	635	376	747	017	57
4	873	241	833	009	274	803	793	1987	658	386	729	001	56
5	896	250	816	2991	298	813	776	970	681	396	711	0985	55
6	58920	0.09259	80799	0.22974	60321	0.09822	79758	0.21953	61704	0.10406	78693	0.20969	54
7	943	269	782	957	344	832	741	937	726	416	676	953	53
8	967	278	765	939	367	841	723	920	749	426	658	937	52
9	990	287	748	922	390	851	706	903	772	436	640	921	51
10	9014	296	730	905	414	861	688	887	795	446	622	905	50
11	037	306	713	888	437	870	671	870	818	456	604	889	49
12	59061	0.09315	80696	0.22870	60460	0.09880	79653	0.21853	61841	0.10466	78586	0.20872	48
13	084	324	679	853	483	889	635	837	864	476	568	856	47
14	108	338	662	836	506	899	618	820	887	486	550	840	46
15	131	343	644	819	529	909	600	803	909	496	532	824	45
16	154	352	628	801	553	918	583	787	932	505	514	808	44
17	178	361	610	784	576	928	565	770	955	515	496	792	43
18	59201	0.09370	80593	0.22767	60599	0.09937	79547	0.21754	61978	0.10525	78478	0.20776	42
19	225	380	576	750	622	947	530	737	2001	535	460	760	41
20	248	389	558	732	645	957	512	720	024	545	442	744	40
21	272	398	541	715	668	966	494	704	046	555	424	728	39
22	295	408	524	698	691	976	477	687	069	565	405	712	38
23	318	417	507	681	714	986	459	671	092	575	387	696	37
24	59342	0.09426	80489	0.22664	60738	0.09995	79441	0.21654	62115	0.10585	78369	0.20681	36
25	365	435	472	647	761	10005	424	638	138	595	351	665	35
26	389	445	455	630	784	015	406	621	160	605	333	649	34
27	412	454	438	613	807	024	388	605	183	615	315	633	33
28	436	463	420	595	830	034	371	588	206	625	297	617	32
29	459	473	403	578	853	044	353	572	229	636	279	601	31
30	59482	0.09482	80386	0.22561	60876	0.10053	79335	0.21555	62251	0.10646	78261	0.20585	30
31	506	491	368	544	899	063	318	539	274	656	243	569	29
32	529	501	351	527	922	073	300	522	297	666	225	553	28
33	552	510	334	510	945	082	282	506	320	676	206	537	27
34	576	520	316	493	968	092	264	490	342	686	188	522	26
35	599	529	299	476	991	102	247	473	365	696	170	506	25
36	59622	0.09538	80282	0.22459	61015	0.10112	79229	0.21457	62388	0.10706	78152	0.20490	24
37	646	548	264	442	038	121	211	440	411	716	134	474	23
38	669	557	247	425	061	131	193	424	433	726	116	458	22
39	693	566	230	408	084	141	179	408	456	736	098	442	21
40	716	576	212	391	107	151	158	391	479	746	079	427	20
41	739	585	195	374	130	160	140	375	502	756	061	411	19
42	59763	0.09595	80178	0.22357	61153	0.10170	79122	0.21358	62524	0.10767	78043	0.20395	18
43	786	604	160	340	176	180	105	342	548	777	025	379	17
44	809	614	143	323	199	190	087	326	570	787	007	364	16
45	832	623	125	306	222	199	069	309	592	797	7988	348	15
46	856	632	108	289	245	209	051	293	515	807	970	332	14
47	879	642	091	273	268	219	033	277	638	817	952	316	13
48	59902	0.09651	80073	0.22256	61291	0 10229	79015	0.21261	62660	0.10827	77934	0.20301	12
49	926	661	056	239	314	239	8998	244	683	838	916	285	11
50	949	670	038	222	337	248	980	228	706	848	897	269	10
51	972	680	021	205	360	258	962	212	728	858	879	254	9
52	995	689	003	188	388	268	944	195	751	868	861	238	8
53	60019	690	79986	171	406	278	926	179	774	878	843	222	7
54	60042	0.09708	79968	0.22154	61429	0.10288	78908	0.21163	62796	0.10888	77824	0.20207	6
55	065	718	951	138	451	298	891	147	819	899	806	191	5
56	089	727	934	121	474	307	873	131	842	909	788	175	4
57	112	737	916	104	497	317	855	114	864	919	769	160	3
58	135	746	899	087	520	327	837	098	887	929	751	144	2
59	158	756	881	070	543	337	819	082	900	940	733	128	1
M			D. 53.				D. 52.				D. 51.		M

A TABLE of NATURAL SINES AND SECANTS LESS RADIUS.

	D. 39.				D. 40.				D. 41.				
M	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	N. S.	S.L.R.	M
0	62932	0.10950	77715	0.20113	64279	0.11575	76604	0.19193	65606	0.12222	75471	0.18306	60
1	955	960	696	097	302	585	586	178	628	233	452	291	59
2	977	970	678	082	323	596	567	163	650	244	433	277	58
3	3000	980	660	066	346	606	548	148	672	255	414	262	57
4	022	991	641	050	368	617	530	133	694	266	395	248	56
5	045	1001	623	035	390	628	511	118	716	277	375	233	55
6	63068	0.11011	77605	0.20019	64412	0.11638	76492	0.19103	65738	0.12288	75356	0.18219	54
7	090	022	586	004	435	649	473	088	759	299	337	204	53
8	113	032	568	19988	457	660	455	073	781	310	318	190	52
9	135	042	550	973	479	670	436	058	803	321	299	175	51
10	158	052	531	957	501	681	417	043	825	332	280	161	50
11	180	063	513	942	524	692	398	028	847	343	261	146	49
12	63203	0.11073	77494	0.19926	64546	0.11702	76380	0.19013	65869	0.12354	75241	0.18132	48
13	225	083	476	911	568	713	361	18998	891	365	222	118	47
14	248	094	458	895	590	724	342	983	913	376	203	103	46
15	271	104	439	880	612	734	323	968	935	387	184	089	45
16	293	114	421	864	635	745	304	953	956	399	165	074	44
17	316	125	402	849	657	756	286	939	978	410	146	060	43
18	63338	0.11135	77384	0.19834	64679	0.11766	76267	0.18924	66000	0.12421	75126	0.18045	42
19	361	145	366	818	701	777	248	909	022	432	107	031	41
20	383	156	347	803	723	788	229	894	044	443	088	017	40
21	406	166	329	787	746	799	210	879	066	454	069	002	39
22	428	176	310	772	768	809	192	864	088	465	050	988	38
23	451	187	292	756	790	820	173	849	109	476	030	7974	37
24	63473	0.11197	77273	0.19741	64812	0.11831	76154	0.18834	66131	0.12487	75011	0.17959	36
25	496	207	255	726	834	842	135	820	153	499	4992	945	35
26	518	218	236	710	856	852	116	805	175	510	973	931	34
27	540	228	218	695	878	863	097	790	197	521	953	916	33
28	563	239	199	680	901	874	078	775	218	532	934	902	32
29	585	249	181	664	923	885	059	760	240	543	915	888	31
30	63608	0.11259	77162	0.19649	64945	0.11895	76041	0.18746	66262	0.12554	74896	0.17874	30
31	630	270	144	634	967	1906	022	731	284	566	876	859	29
32	653	280	125	618	989	917	003	716	306	577	857	845	28
33	675	291	107	603	5011	928	5984	701	327	588	838	831	27
34	698	301	088	588	033	939	965	686	349	599	818	816	26
35	720	312	070	572	055	949	946	672	371	610	799	802	25
36	63742	0.11322	77051	0.19557	65077	0.11960	75927	0.18657	66393	0.12622	74780	0.17788	24
37	765	332	033	542	099	971	908	642	414	633	760	774	23
38	787	343	014	527	122	982	889	628	436	644	741	760	22
39	810	353	6996	511	144	993	870	613	458	655	722	745	21
40	832	364	977	496	166	2004	851	598	480	666	703	731	20
41	854	374	959	481	188	015	832	583	501	678	683	717	19
42	63877	0.11385	76940	0.19466	65210	0.12025	75813	0.18569	66523	0.12689	74664	0.17703	18
43	899	395	921	450	232	036	794	554	545	700	644	689	17
44	922	406	903	435	254	047	775	539	566	712	625	674	16
45	944	416	884	420	276	058	756	525	588	723	606	660	15
46	966	427	866	405	298	069	738	510	610	734	586	646	14
47	989	437	847	390	320	080	719	495	632	745	567	632	13
48	64011	0.11448	76828	0.19375	65342	0.12091	75700	0.18481	66653	0.12757	74548	0.17618	12
49	033	458	810	359	364	102	680	466	675	768	528	604	11
50	056	469	791	344	386	113	661	451	697	779	509	590	10
51	078	479	772	329	408	123	642	437	718	791	489	576	9
52	100	490	754	314	430	134	623	422	740	802	470	561	8
53	123	501	735	299	452	145	604	408	762	813	451	547	7
54	64145	0.11511	76717	0.19284	65474	0.12156	75585	0.18393	66783	0.12825	74431	0.17533	6
55	167	522	698	269	496	167	566	373	805	836	412	519	5
56	190	532	679	254	518	178	547	364	827	847	392	505	4
57	212	543	661	238	540	189	528	349	848	859	373	491	3
58	234	553	642	223	562	200	509	335	870	870	353	477	2
59	256	564	623	208	584	211	490	320	891	881	334	436	1
M			D. 50.				D. 49.				D. 48.		M

A TABLE of NATURAL SINES AND SECANTS LESS RADIUS.

	D. 42.		D. 41.		D. 43.		D. 40.		D. 44.		D. 39.		
M	N. S.	S. L. R.	N. S.	S. L. R.	N. S.	S. L. R.	N. S.	S. L. R.	N. S.	S. L. R.	N. S.	S. L. R.	M
0	66913	0.12893	74314	0.17449	68200	0.13587	73135	0.16622	69466	0.14307	71934	0.15823	60
1	935	904	295	435	221	599	116	608	487	319	914	810	59
2	956	915	276	421	242	611	096	595	508	331	894	797	58
3	978	927	256	407	264	623	076	581	529	343	873	784	57
4	999	938	237	393	285	634	056	568	549	355	853	771	56
5	7021	950	217	379	306	646	036	554	570	368	833	758	55
6	67043	0.12961	74198	0.17365	68327	0.13658	73016	0.16541	69591	0.14380	71813	0.15745	54
7	064	972	178	351	349	670	2996	527	612	392	792	731	53
8	086	984	159	337	370	682	976	514	633	404	772	718	52
9	107	995	139	323	391	694	957	500	654	417	752	705	51
10	129	3007	120	309	412	705	937	487	675	429	732	692	50
11	151	018	100	295	433	717	917	473	696	441	711	679	49
12	67172	0.13030	74080	0.17281	68455	0.13729	72897	0.16460	69717	0.14453	71691	0.15666	48
13	194	041	061	267	476	741	877	446	737	466	671	653	47
14	215	053	041	253	497	753	857	433	758	478	650	640	46
15	237	064	022	239	518	765	837	419	779	490	630	627	45
16	258	076	002	225	539	777	817	406	800	503	610	615	44
17	280	087	3983	212	561	789	797	392	821	515	590	602	43
18	67301	0.13098	73963	0.17198	68582	0.13800	72777	0.16379	69842	0.14527	71569	0.15589	42
19	323	110	944	184	603	812	757	366	862	540	549	576	41
20	344	121	924	170	624	824	737	352	883	552	529	563	40
21	366	133	904	156	645	836	717	339	904	564	508	550	39
22	387	145	885	142	666	848	697	326	925	577	488	537	38
23	409	156	865	128	688	860	677	312	946	589	468	524	37
24	67430	0.13168	73846	0.17115	68709	0.13872	72657	0.16299	69966	0.14601	71447	0.15511	36
25	452	179	826	101	730	884	637	285	987	614	427	498	35
26	473	191	806	087	751	896	617	272	70008	626	406	485	34
27	495	202	787	073	772	908	597	259	029	639	386	472	33
28	516	214	767	059	793	920	577	245	049	651	366	460	32
29	538	225	747	045	814	932	557	232	070	663	345	447	31
30	67559	0.13237	73728	0.17032	68835	0.13944	72537	0.16219	70091	0.14676	71325	0.15434	30
31	580	248	708	018	857	956	517	205	112	688	305	421	29
32	602	260	688	004	878	968	497	192	132	701	284	408	28
33	623	272	669	6990	899	980	477	179	153	713	264	395	27
34	645	283	649	977	920	992	457	166	174	726	243	382	26
35	666	295	629	963	941	4004	437	152	195	738	223	370	25
36	67688	0.13306	73610	0.16949	68962	0.14016	72417	0.16139	70215	0.14750	71203	0.15377	24
37	709	318	590	935	983	028	397	126	236	763	182	344	23
38	730	330	570	922	9004	040	377	113	257	775	162	331	22
39	752	341	551	908	025	052	357	099	277	788	141	318	21
40	773	353	531	894	046	064	337	086	298	800	121	306	20
41	795	365	511	880	067	076	317	073	319	813	100	293	19
42	67816	0.13376	73491	0.16867	69088	0.14088	72297	0.16060	70339	0.14825	71080	0.15280	18
43	837	388	472	853	109	100	277	046	360	838	059	267	17
44	859	400	452	839	138	112	257	033	381	850	039	255	16
45	880	411	432	826	150	124	236	020	401	863	019	242	15
46	901	423	412	812	172	136	216	007	422	875	0998	229	14
47	923	435	393	798	193	149	196	5994	443	888	978	216	13
48	67944	0.13446	73373	0.16785	69214	0.14161	72176	0.15980	70463	0.14900	70957	0.15204	12
49	965	458	353	771	235	173	156	967	484	913	937	191	11
50	987	470	333	758	256	185	136	954	505	926	916	178	10
51	8008	482	314	744	277	197	116	941	525	938	896	165	9
52	029	493	294	739	298	209	095	928	546	951	875	153	8
53	051	505	274	717	319	221	075	915	567	963	855	140	7
54	68072	0.13517	73254	0.16703	69340	0.14234	72555	0.15902	70587	0.14976	70834	0.15127	6
55	093	528	234	689	361	246	035	888	608	988	813	115	5
56	115	540	215	676	382	268	015	875	628	5001	793	102	4
57	136	552	195	662	403	270	1995	862	649	014	772	089	3
58	157	564	175	649	424	282	974	849	670	026	752	077	2
59	179	575	155	635	445	294	954	836	690	039	731	064	1
											711	051	0
M	D. 48.		D. 47.		D. 49.		D. 46.		D. 50.		D. 45.		M

A

TABLE

OF

COMMON LOGARITHMS,

FROM

A UNIT TO TEN THOUSAND.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.
1	0. 00000	21	3. 32222	41	1. 61278	61	1. 78533	81	1. 90849
2	30103	2	4242	2	2325	2	9239	2	1381
3	47712	3	6173	3	3347	3	9934	3	1908
4	60206	4	8021	4	4345	4	80618	4	2428
5	69897	5	9794	5	5321	5	1291	5	2942
6	0. 77815	26	1. 41497	46	1. 66276	66	1. 81954	86	1. 93450
7	84510	7	3136	7	7210	7	2607	7	3952
8	90309	8	4716	8	8124	8	3251	8	4448
9	95424	9	6240	9	9020	9	3885	9	4939
10	1. 00000	30	7712	50	9897	70	4510	90	5424
11	1. 04139	31	1. 49136	51	1. 70757	71	1. 85126	91	1. 95904
2	7918	2	50515	2	1600	2	5733	2	6379
3	11394	3	1851	3	2428	3	6332	3	6848
4	4613	4	3148	4	3239	4	6923	4	7313
5	7609	5	4407	5	4036	5	7506	5	7772
16	1. 20412	36	1. 55630	56	1. 74819	76	1. 88081	96	1. 98227
7	3045	7	6820	7	5587	7	8649	7	8677
8	5527	8	7978	8	6343	8	9209	8	9123
9	7875	9	9106	9	7085	9	9763	9	9564
20	30103	40	60206	60	7815	80	90309	100	2. 00000

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10,000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L.
101	2. 00432	151	2. 17898	201	2. 30320	251	2. 39967	301	2. 47857	351	2. 54531
2	0860	2	8184	2	0535	2	40140	2	8001	2	4654
3	1284	3	8469	3	0750	3	0312	3	8144	3	4777
4	1703	4	8752	4	0963	4	0483	4	8287	4	4900
5	2119	5	9033	5	1175	5	0654	5	8430	5	5023
106	2. 02531	156	2. 19312	206	2. 31387	256	2. 40824	306	2. 48572	356	2. 55145
7	2938	7	9590	7	1597	7	0993	7	8714	7	5267
8	3342	8	9866	8	1806	8	1162	8	8855	8	5389
9	3743	9	20140	9	2015	9	1330	9	8996	9	5508
10	4139	60	0412	10	2222	60	1497	10	9136	60	5630
111	2. 04532	161	2. 20683	211	2. 32428	261	2. 41664	311	2. 49276	361	2. 55751
2	4922	2	0952	2	2634	2	1830	2	9415	2	5871
3	5308	3	1219	3	2838	3	1996	3	9554	3	5991
4	5690	4	1484	4	3041	4	2160	4	9693	4	6110
5	6070	5	1748	5	3244	5	2325	5	9831	5	6229
116	2. 06446	166	2. 22011	216	2. 33445	266	2. 42488	316	2. 49969	366	2. 56348
7	6819	7	2272	7	3646	7	2651	7	50106	7	6467
8	7188	8	2531	8	3846	8	2813	8	0243	8	6585
9	7555	9	2789	9	4044	9	2975	9	0379	9	6703
20	7918	70	3045	20	4242	70	3136	20	0515	70	6820
121	2. 08279	171	2. 23300	221	2. 34439	271	2. 43297	321	2. 50651	371	2. 56937
2	8636	2	3553	2	4635	2	3457	2	0786	2	7054
3	8991	3	3805	3	4830	3	3616	3	0920	3	7171
4	9342	4	4055	4	5025	4	3775	4	1055	4	7287
5	9691	5	4304	5	5218	5	3933	5	1188	5	7403
126	2. 10037	176	2. 24551	226	2. 35411	276	2. 44091	326	2. 51322	376	2. 57519
7	0380	7	4797	7	5603	7	4248	7	1455	7	7634
8	0721	8	5042	8	5793	8	4404	8	1587	8	7749
9	1059	9	5285	9	5984	9	4560	9	1720	9	7864
30	1394	80	5527	30	6173	80	4716	30	1851	80	7978
131	2. 11727	181	2. 25768	231	2. 36361	281	2. 44871	331	2. 51983	381	2. 58093
2	2057	2	6007	2	6549	2	5025	2	2114	2	8206
3	2385	3	6245	3	6736	3	5179	3	2244	3	8320
4	2710	4	6482	4	6922	4	5332	4	2375	4	8433
5	3033	5	6717	5	7107	5	5484	5	2504	5	8546
136	2. 13354	186	2. 26951	236	2. 37291	286	2. 45637	336	2. 52634	386	2. 58659
7	3672	7	7184	7	7475	7	5788	7	2763	7	8771
8	3988	8	7416	8	7658	8	5939	8	2892	8	8883
9	4301	9	7646	9	7840	9	6090	9	3020	9	8995
40	4613	90	7875	40	8021	90	6240	40	3148	90	9106
141	2. 14922	191	2. 28103	241	2. 38202	291	2. 46389	341	2. 53275	391	2. 59218
2	5229	2	8330	2	8382	2	6538	2	3403	2	9329
3	5534	3	8556	3	8561	3	6687	3	3529	3	9439
4	5836	4	8780	4	8739	4	6835	4	3656	4	9550
5	6137	5	9003	5	8917	5	6982	5	3782	5	9660
146	2. 16435	196	2. 29226	246	2. 39094	296	2. 47129	346	2. 53908	396	2. 59770
7	6732	7	9447	7	9270	7	7276	7	4033	7	9879
8	7026	8	9667	8	9445	8	7422	8	4158	8	9988
9	7319	9	9885	9	9620	9	7567	9	4283	9	60097
50	7609	200	30103	50	9794	300	7712	350	4407	400	0206

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10,000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L.
401	2. 60314	451	2. 65418	501	2. 69984	551	2. 74115	601	2. 77887	651	2. 81358
2	0423	2	5514	2	70070	2	4194	2	7960	2	1425
3	0531	3	5610	3	0157	3	4273	3	8032	3	1491
4	0638	4	5706	4	0243	4	4351	4	8104	4	1558
5	0746	5	5801	5	0329	5	4429	5	8176	5	1624
406	2. 60853	456	2. 65896	506	2. 70415	556	2. 74507	606	2. 78247	656	2. 81690
7	0959	7	5992	7	0501	7	4586	7	8319	7	1757
8	1066	8	6087	8	0586	8	4663	8	8390	8	1823
9	1172	9	6181	9	0672	9	4741	9	8462	9	1889
10	1278	60	6276	10	0757	60	4819	10	8533	60	1954
411	2. 61384	461	2. 66370	511	2. 70842	561	2. 74896	611	2. 78604	661	2. 82020
2	1490	2	6464	2	0927	2	4974	2	8675	2	2086
3	1595	3	6558	3	1012	3	5051	3	8746	3	2151
4	1700	4	6652	4	1096	4	5128	4	8817	4	2217
5	1805	5	6745	5	1181	5	5205	5	8888	5	2282
416	2. 61909	466	2. 66839	516	2. 71265	566	2. 75282	616	2. 78958	666	2. 82347
7	2014	7	6932	7	1349	7	5358	7	9029	7	2413
8	2118	8	7025	8	1433	8	5435	8	9099	8	2478
9	2221	9	7117	9	1517	9	5511	9	9169	9	2543
20	2325	70	7210	20	1600	70	5587	20	9239	70	2607
421	2. 62428	471	2. 67302	521	2. 71684	571	2. 75664	621	2. 79309	671	2. 82672
2	2531	2	7394	2	1767	2	5740	2	9379	2	2737
3	2634	3	7486	3	1850	3	5815	3	9449	3	2802
4	2737	4	7578	4	1933	4	5891	4	9518	4	2866
5	2839	5	7669	5	2016	5	5967	5	9588	5	2930
426	2. 62941	476	2. 67761	526	2. 72099	576	2. 76042	626	2. 79657	676	2. 82995
7	3043	7	7852	7	2181	7	6118	7	9727	7	3059
8	3144	8	7943	8	2263	8	6193	8	9796	8	3120
9	3246	9	8034	9	2346	9	6268	9	9865	9	3187
30	3347	80	8124	30	2428	80	6343	30	9934	80	3251
431	2. 63448	481	2. 68215	531	2. 72509	581	2. 76418	631	2. 80003	681	2. 83315
2	3548	2	8305	2	2591	2	6492	2	0072	2	3378
3	3649	3	8395	3	2673	3	6567	3	0140	3	3442
4	3749	4	8485	4	2754	4	6641	4	0209	4	3506
5	3849	5	8574	5	2835	5	6716	5	0277	5	3569
436	2. 63949	486	2. 68664	536	2. 72916	586	2. 76790	636	2. 80346	686	2. 83632
7	4048	7	8753	7	2997	7	6864	7	0414	7	3696
8	4147	8	8842	8	3078	8	6938	8	0482	8	3759
9	4246	9	8931	9	3159	9	7012	9	0550	9	3822
40	4345	90	9020	40	3239	90	7085	40	0618	90	3885
441	2. 64444	491	2. 69108	541	2. 73320	591	2. 77159	641	2. 80686	691	2. 83948
2	4542	2	9197	2	3400	2	7232	2	0754	2	4011
3	4640	3	9285	3	3480	3	7305	3	0821	3	4073
4	4738	4	9373	4	3560	4	7379	4	0889	4	4136
5	4836	5	9461	5	3640	5	7452	5	0956	5	4198
446	2. 64933	496	2. 69548	546	2. 73719	596	2. 77525	646	2. 81023	696	2. 84261
7	5031	7	9636	7	3799	7	7597	7	1090	7	4323
8	5128	8	9723	8	3878	8	7670	8	1158	8	4386
9	5225	9	9810	9	3957	9	7743	9	1224	9	4448
50	5321	500	9897	50	4036	600	7815	50	1291	700	4510

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10,000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L.
701	2. 84572	751	2. 87564	801	2. 90363	851	2. 92993	901	2. 95472	951	2. 97818
2	634	2	622	2	417	2	3044	2	521	2	864
3	696	3	680	3	472	3	095	3	569	3	909
4	757	4	737	4	526	4	146	4	617	4	955
5	819	5	795	5	580	5	197	5	665	5	8000
706	2. 84880	756	2. 87852	806	2. 90634	856	2. 93247	906	2. 95713	956	2. 98046
7	942	7	910	7	687	7	298	7	761	7	091
8	5003	8	967	8	741	8	349	8	809	8	137
9	065	9	8024	9	795	9	399	9	856	9	182
10	126	60	081	10	849	60	450	10	904	60	227
711	2. 85188	761	2. 88138	811	2. 90902	861	2. 93500	911	2. 95952	961	2. 98272
2	248	2	196	2	956	2	551	2	999	2	318
3	309	3	252	3	1009	3	601	3	6047	3	363
4	370	4	309	4	062	4	651	4	095	4	408
5	431	5	366	5	116	5	702	5	142	5	453
716	2. 85491	766	2. 88423	816	2. 91169	866	2. 93752	916	2. 96190	966	2. 98498
7	552	7	480	7	222	7	802	7	237	7	543
8	612	8	536	8	275	8	852	8	284	8	588
9	673	9	593	9	328	9	902	9	332	9	632
20	733	70	649	20	381	70	952	20	379	70	677
721	2. 85794	771	2. 88705	821	2. 91434	871	2. 94002	921	2. 96426	971	2. 98722
2	854	2	762	2	487	2	052	2	473	2	767
3	914	3	818	3	540	3	101	3	520	3	811
4	974	4	874	4	593	4	151	4	567	4	856
5	6034	5	930	5	645	5	201	5	614	5	900
726	2. 86094	776	2. 88986	826	2. 91698	876	2. 94250	926	2. 96661	976	2. 98945
7	153	7	9042	7	751	7	300	7	708	7	989
8	213	8	098	8	803	8	349	8	755	8	9034
9	273	9	154	9	855	9	399	9	802	9	078
30	332	80	209	30	908	80	448	30	848	80	123
731	2. 86392	781	2. 89265	831	2. 91960	881	2. 94498	931	2. 96895	981	2. 99167
2	451	2	321	2	2012	2	547	2	942	2	211
3	510	3	376	3	065	3	596	3	988	3	255
4	570	4	432	4	117	4	645	4	7035	4	300
5	629	5	487	5	169	5	694	5	081	5	344
736	2. 86688	786	2. 89542	836	2. 92221	886	2. 94743	936	2. 97128	986	2. 99388
7	747	7	597	7	273	7	792	7	174	7	432
8	806	8	653	8	324	8	841	8	220	8	476
9	864	9	708	9	376	9	890	9	267	9	520
40	923	90	763	40	428	90	939	40	313	90	564
741	2. 86982	791	2. 89818	841	2 92480	891	2. 9498	941	2. 97359	991	2. 99607
2	7040	2	873	2	531	2	5036	2	405	2	651
3	099	3	927	3	583	3	085	3	451	3	695
4	157	4	982	4	634	4	134	4	497	4	739
5	216	5	2. 90037	5	686	5	182	5	543	5	782
746	2. 87274	796	2. 90091	846	2. 92737	896	2. 95231	946	2. 97589	996	2. 99826
7	332	7	146	7	788	7	279	7	635	7	870
8	390	8	200	8	840	8	328	8	681	8	913
9	448	9	255	9	891	9	376	9	727	9	957
50	506	800	309	50	942	900	424	50	772	1000	3. 00000

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10.000.

N.	L.	N.	L.	N.	L.	N.	L.	N	L.	N.	L.
1001	3. 00043	1051	3. 02160	1101	3. 04179	1151	3. 06108	1201	3. 07954	1251	3. 09726
2	087	2	202	2	218	2	145	2	990	2	760
3	130	3	243	3	258	3	183	3	8027	3	795
4	173	4	284	4	297	4	221	4	063	4	830
5	217	5	325	5	336	5	258	5	099	5	864
1006	3. 00260	1056	3. 02366	1106	3. 04376	1156	3. 06296	1206	3. 08135	1256	3. 09899
7	303	7	408	7	415	7	333	7	171	7	934
8	346	8	449	8	454	8	371	8	207	8	968
9	389	9	490	9	493	9	408	9	243	9	10003
10	432	60	531	10	532	60	446	10	279	60	037
1011	3. 00475	1061	3. 02572	1111	3. 04571	1161	3. 06483	1211	3. 08314	1261	3. 10072
2	518	2	612	2	610	2	521	2	350	2	106
3	561	3	653	3	650	3	558	3	386	3	140
4	604	4	694	4	689	4	595	4	422	4	175
5	647	5	735	5	727	5	633	5	458	5	209
1016	3. 00689	1066	3. 02776	1116	3. 04766	1166	3. 06670	1216	3. 08493	1266	3. 10243
7	732	7	816	7	805	7	707	7	529	7	278
8	775	8	857	8	844	8	744	8	565	8	312
9	817	9	898	9	883	9	781	9	600	9	346
20	860	70	938	20	922	70	819	20	636	70	380
1021	3. 00903	1071	3. 02979	1121	3. 04961	1171	3. 06856	1221	3. 08672	1271	3. 10415
2	945	2	3019	2	999	2	893	2	707	2	449
3	988	3	060	3	5038	3	930	3	743	3	483
4	1030	4	100	4	077	4	967	4	778	4	517
5	072	5	141	5	115	5	7004	5	814	5	551
1026	3. 01115	1076	3. 03181	1126	3. 05154	1176	3. 07041	1226	3. 08849	1276	3. 10585
7	157	7	222	7	192	7	078	7	884	7	619
8	199	8	262	8	231	8	115	8	920	8	653
9	242	9	302	9	269	9	151	9	955	9	687
30	284	80	342	30	308	80	188	30	991	80	721
1031	3. 01326	1081	3. 03383	1131	3. 05346	1181	3. 07225	1231	3. 09026	1281	3. 10755
2	368	2	423	2	385	2	262	2	061	2	789
3	410	3	463	3	423	3	298	3	096	3	823
4	452	4	503	4	461	4	335	4	132	4	857
5	494	5	543	5	500	5	372	5	167	5	890
1036	3. 01536	1086	3. 03583	1136	3. 05538	1186	3. 07408	1236	3. 09202	1286	3. 10924
7	578	7	623	7	576	7	445	7	237	7	958
8	620	8	663	8	614	8	482	8	272	8	992
9	662	9	703	9	652	9	518	9	307	9	1025
40	703	90	743	40	690	90	555	40	342	90	059
1041	3. 01745	1091	3. 03782	1141	3. 05729	1191	3. 07591	1241	3. 09377	1291	3. 11093
2	787	2	822	2	767	2	628	2	412	2	126
3	828	3	862	3	805	3	664	3	447	3	160
4	870	4	902	4	843	4	700	4	482	4	193
5	912	5	941	5	881	5	737	5	517	5	227
1046	3. 01953	1096	3. 03981	1146	3. 05918	1196	3. 07773	1246	3. 09552	1296	3. 11261
7	995	7	4021	7	956	7	809	7	587	7	294
8	2036	8	060	8	994	8	846	8	621	8	327
9	078	9	100	9	6032	9	882	9	656	9	361
50	119	1100	139	50	070	1200	918	50	691	1300	394

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10,000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L.
1301	3. 11428	1351	3, 13066	1401	3. 14644	1451	3. 16167	1501	3. 17638	1551	3. 19061
2	461	2	098	2	675	2	197	2	667	2	089
3	494	3	130	3	706	3	227	3	696	3	117
4	528	4	162	4	737	4	256	4	725	4	145
5	561	5	194	5	768	5	286	5	754	5	173
1306	3. 11594	1356	3. 13226	1406	3. 14799	1456	3. 16316	1506	3. 17783	1556	3. 19201
7	628	7	258	7	829	7	346	7	811	7	229
8	661	8	290	8	860	8	376	8	840	8	257
9	694	9	322	9	891	9	406	9	869	9	285
10	727	60	354	10	922	60	435	10	898	60	312
1311	3. 11760	1361	3. 13386	1411	3. 14953	1461	3. 16465	1511	3. 17926	1561	3. 19340
2	793	2	418	2	983	2	495	2	955	2	368
3	826	3	450	3	5014	3	524	3	984	3	396
4	860	4	481	4	045	4	554	4	18013	4	424
5	893	5	513	5	076	5	584	5	041	5	451
1316	3. 11926	1366	3. 13545	1416	3. 15106	1466	3. 16613	1516	3. 18070	1566	3. 19479
7	959	7	577	7	137	7	643	7	099	7	507
8	992	8	609	8	168	8	673	8	127	8	535
9	2024	9	640	9	198	9	702	9	156	9	562
20	057	70	672	20	229	70	732	20	184	70	590
1321	3. 12090	1371	3. 13704	1421	3. 15259	1471	3. 16761	1521	3. 18213	1571	3. 19618
2	123	2	735	2	290	2	791	2	241	2	645
3	156	3	767	3	320	3	820	3	270	3	673
4	189	4	799	4	351	4	850	4	299	4	700
5	222	5	830	5	381	5	879	5	327	5	728
1326	3. 12254	1376	3. 13862	1426	3. 15412	1476	3. 16909	1526	3. 18355	1576	3. 19756
7	287	7	893	7	442	7	938	7	384	7	783
8	320	8	925	8	473	8	967	8	412	8	811
9	353	9	956	9	503	9	997	9	441	9	838
30	385	80	988	30	534	80	7026	30	469	80	866
1331	3. 12418	1381	3. 14019	1431	3. 15564	1481	3. 17056	1531	3. 18498	1581	3. 19893
2	450	2	051	2	594	2	085	2	526	2	921
3	483	3	082	3	625	3	114	3	554	3	948
4	516	4	114	4	655	4	143	4	583	4	976
5	548	5	145	5	685	5	173	5	611	5	20003
1336	3. 12581	1386	3. 14176	1436	3. 15715	1486	3. 17202	1536	3. 18639	1586	3. 20030
7	613	7	208	7	746	7	231	7	667	7	058
8	646	8	239	8	776	8	260	8	696	8	085
9	678	9	270	9	806	9	289	9	724	9	112
40	710	90	301	40	836	90	319	40	752	90	140
1341	3. 12743	1391	3. 14333	1441	3. 15866	1491	3. 17348	1541	3. 18780	1591	3. 20167
2	775	2	364	2	897	2	377	2	808	2	194
3	808	3	395	3	927	3	406	3	837	3	222
4	840	4	426	4	957	4	435	4	865	4	249
5	872	5	457	5	987	5	464	5	893	5	276
1346	3. 12905	1396	3. 14489	1446	3. 16017	1496	3. 17493	1546	3. 18921	1596	3. 20303
7	937	7	520	7	047	7	522	7	949	7	330
8	969	8	551	8	077	8	551	8	977	8	358
9	3001	9	582	9	107	9	580	9	19005	9	385
50	033	1400	613	50	137	1500	609	1550	033	1600	412

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10.000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L
1601	3. 20439	1651	3. 21775	1701	3. 23070	1751	3. 24329	1801	3. 25551	1851	3. 26741
2	466	2	801	2	096	2	353	2	575	2	764
3	493	3	827	3	121	3	378	3	600	3	788
4	520	4	854	4	147	4	403	4	624	4	811
5	548	5	880	5	172	5	428	5	648	5	834
1606	3. 20575	1656	3. 21906	1706	3. 23198	1756	3. 24452	1806	3. 25672	1856	3. 26858
7	602	7	932	7	223	7	477	7	696	7	881
8	629	8	958	8	249	8	502	8	720	8	905
9	656	9	985	9	274	9	527	9	744	9	928
10	683	60	2011	10	300	60	551	10	768	60	951
1611	3. 20710	1661	3. 22037	1711	3. 23325	1761	3. 24576	1811	3. 25792	1861	3. 26975
2	737	2	063	2	350	2	601	2	816	2	998
3	763	3	089	3	376	3	625	3	840	3	7021
4	790	4	115	4	401	4	650	4	864	4	045
5	817	5	141	5	426	5	674	5	888	5	068
1616	3. 20844	1666	3. 22168	1716	3. 23452	1766	3. 24699	1816	3. 25912	1866	3. 27091
7	871	7	194	7	477	7	724	7	935	7	114
8	898	8	220	8	502	8	748	8	959	8	138
9	925	9	246	9	528	9	773	9	983	9	161
20	952	70	272	20	553	70	797	20	6007	70	184
1621	3. 20978	1671	3. 22298	1721	3. 23578	1771	3. 24822	1821	3. 26031	1871	3. 27207
2	1005	2	324	2	603	2	846	2	055	2	231
3	032	3	350	3	629	3	871	3	079	3	254
4	059	4	376	4	654	4	895	4	102	4	277
5	085	5	401	5	679	5	920	5	126	5	300
1626	3. 21112	1676	3. 22427	1726	3. 23704	1776	3. 24944	1826	3. 26150	1876	3. 27323
7	139	7	453	7	729	7	969	7	174	7	346
8	165	8	479	8	754	8	993	8	198	8	370
9	192	9	505	9	780	9	5018	9	221	9	393
30	219	80	531	30	805	80	042	30	245	80	416
1631	3. 21245	1681	3. 22557	1731	3. 23830	1781	3. 25066	1831	3. 26269	1881	3. 27439
2	272	2	583	2	855	2	091	2	293	2	462
3	299	3	608	3	880	3	115	3	316	3	485
4	325	4	634	4	905	4	139	4	340	4	508
5	352	5	660	5	930	5	164	5	364	5	531
1636	3. 21378	1686	3. 22686	1736	3. 23955	1786	3. 25188	1836	3. 26387	1886	3. 27554
7	405	7	712	7	980	7	212	7	411	7	577
8	431	8	737	8	4005	8	237	8	435	8	600
9	458	9	763	9	030	9	261	9	458	9	623
40	484	90	789	40	055	90	285	40	482	90	646
1641	3. 21511	1691	3. 22814	1741	3. 24080	1791	3. 25310	1841	3. 26505	1891	3. 27669
2	537	2	840	2	105	2	334	2	529	2	692
3	564	3	866	3	130	3	358	3	553	3	715
4	590	4	891	4	155	4	382	4	576	4	738
5	617	5	917	5	180	5	406	5	600	5	761
1646	3. 21643	1696	3. 22943	1746	3. 24204	1796	3. 25431	1846	3 26623	1896	3. 27784
7	669	7	968	7	229	7	455	7	647	7	807
8	696	8	994	8	254	8	479	8	670	8	830
9	722	9	3019	9	279	9	503	9	604	9	853
50	748	1700	045	50	304	1800	527	50	717	1900	875

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10,000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L.
1901	3. 27898	1951	3. 29026	2001	3. 30125	2051	3. 31197	2101	3. 32243	2151	3. 33264
2	921	2	048	2	146	2	218	2	263	2	284
3	944	3	070	3	168	3	239	3	284	3	304
4	967	4	092	4	190	4	260	4	305	4	325
5	990	5	115	5	211	5	281	5	325	5	345
1906	3. 28012	1956	3. 29137	2006	3. 30233	2056	3. 31302	2106	3. 32346	2156	3. 33365
7	035	7	159	7	255	7	323	7	366	7	385
8	058	8	181	8	276	8	345	8	387	8	405
9	081	9	203	9	298	9	366	9	408	9	425
10	103	60	226	10	320	60	387	10	428	60	445
1911	3. 28126	1961	3. 29248	2011	3. 30341	2061	3. 31408	2111	3. 32449	2161	3. 33465
2	149	2	270	2	363	2	429	2	469	2	486
3	172	3	292	3	384	3	450	3	490	3	506
4	194	4	314	4	406	4	471	4	511	4	526
5	217	5	336	5	428	5	492	5	531	5	546
1916	3. 28240	1966	3. 29358	2016	3. 30449	2066	3. 31513	2116	3. 32552	2166	3. 33566
7	262	7	380	7	471	7	534	7	572	7	586
8	285	8	403	8	492	8	555	8	593	8	606
9	308	9	425	9	514	9	576	9	613	9	626
20	330	70	447	20	535	70	597	20	634	70	646
1921	3. 28353	1971	3. 29469	2021	3. 30557	2071	3. 31618	2121	3. 32654	2171	3. 33666
2	375	2	491	2	578	2	639	2	675	2	686
3	398	3	513	3	600	3	660	3	695	3	706
4	421	4	535	4	621	4	681	4	715	4	726
5	443	5	557	5	643	5	702	5	736	5	746
1926	3. 28466	1976	3. 29579	2026	3. 30664	2076	3. 31723	2126	3. 32756	2176	3. 33766
7	488	7	601	7	685	7	744	7	777	7	786
8	511	8	623	8	707	8	765	8	797	8	806
9	533	9	645	9	728	9	785	9	818	9	826
30	556	80	667	30	750	80	806	30	838	80	846
1931	3. 28578	1981	3. 29688	2031	3. 30771	2081	3. 31827	2131	3. 32858	2181	3. 33866
2	601	2	710	2	792	2	848	2	879	2	885
3	623	3	732	3	814	3	869	3	899	3	905
4	646	4	754	4	835	4	890	4	919	4	925
5	668	5	776	5	856	5	911	5	940	5	945
1936	3. 28691	1986	3. 29798	2036	3. 30878	2086	3. 31931	2136	3. 32960	2186	3. 33965
7	713	7	820	7	899	7	952	7	980	7	985
8	735	8	842	8	920	8	973	8	3001	8	4005
9	758	9	863	9	942	9	994	9	021	9	025
40	780	90	885	40	963	90	2015	40	041	90	044
1941	3. 28803	1991	3. 29907	2041	3. 30984	2091	3. 32035	2141	3. 33062	2191	3. 34964
2	825	2	929	2	1006	2	056	2	082	2	084
3	847	3	951	3	027	3	077	3	102	3	104
4	870	4	973	4	048	4	098	4	122	4	124
5	892	5	994	5	069	5	118	5	143	5	143
1946	3. 28914	1996	3. 30016	204	3. 31091	2096	3. 32139	2146	3. 33163	2196	3. 34163
7	937	7	038	7	112	7	160	7	183	7	183
8	959	8	060	8	133	8	181	8	203	8	203
9	981	9	082	9	154	9	201	9	224	9	223
50	29003	2000	103	50	175	2100	222	50	244	2200	242

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L
2201	3. 34262	2251	3. 35238	2301	3. 36192	2351	3. 37125	2401	3. 38039	2451	3. 38934
2	282	2	257	2	211	2	144	2	057	2	952
3	301	3	276	3	229	3	162	3	075	3	970
4	321	4	295	4	248	4	181	4	093	4	987
5	341	5	315	5	267	5	199	5	112	5	9005
2206	3. 34361	2256	3. 35334	2306	3. 36286	2356	3. 37218	2406	3. 38130	2456	3. 39022
7	380	7	353	7	305	7	236	7	146	7	041
8	400	8	372	8	324	8	254	8	166	8	058
9	420	9	392	9	342	9	273	9	184	9	076
10	439	60	411	10	361	60	291	10	202	60	094
2211	3. 34459	2261	3. 35430	2311	3. 36380	2361	3. 37310	2411	3. 38220	2461	3. 39111
2	479	2	449	2	399	2	328	2	238	2	129
3	498	3	468	3	418	3	346	3	256	3	146
4	518	4	488	4	436	4	365	4	274	4	164
5	537	5	507	5	455	5	383	5	292	5	182
2216	3. 34557	2266	3. 35526	2316	3. 36474	2366	3. 37401	2416	3. 38310	2466	3. 39199
7	577	7	545	7	493	7	420	7	328	7	217
8	596	8	564	8	511	8	438	8	346	8	236
9	616	9	583	9	530	9	457	9	364	9	252
20	635	70	603	20	549	70	475	20	382	70	270
2221	3. 34655	2271	3. 35622	2321	3. 36568	2371	3. 37493	2421	3. 38399	2471	3. 39287
2	674	2	641	2	586	2	511	2	417	2	305
3	694	3	660	3	605	3	530	3	435	3	322
4	713	4	679	4	624	4	548	4	453	4	340
5	733	5	698	5	642	5	566	5	471	5	358
2226	3. 34753	2276	3. 35717	2326	3. 36661	2376	3. 37585	2426	3. 38489	2476	3. 39375
7	772	7	736	7	680	7	603	7	507	7	392
8	792	8	755	8	698	8	621	8	525	8	410
9	811	9	774	9	717	9	639	9	543	9	428
30	830	80	793	30	736	80	658	30	561	80	445
2231	3. 34850	2281	3. 35813	2331	3. 36754	2381	3. 37676	2431	3. 38579	2481	3. 39463
2	869	2	832	2	773	2	694	2	596	2	480
3	889	3	851	3	791	3	712	3	614	3	498
4	908	4	870	4	810	4	731	4	632	4	515
5	928	5	889	5	829	5	749	5	650	5	533
2236	3. 34947	2286	3. 35908	2336	3. 36847	2386	3. 37767	2436	3. 38668	2486	3. 39550
7	967	7	927	7	866	7	785	7	686	7	568
8	986	8	946	8	884	8	803	8	703	8	585
9	5005	9	965	9	903	9	822	9	721	9	602
40	025	90	984	40	922	90	840	40	739	90	620
2241	3. 35044	2291	3. 36003	2341	3. 36940	2391	3. 37858	2441	3. 38757	2491	3. 39637
2	065	2	021	2	959	2	876	2	775	2	655
3	083	3	040	3	977	3	894	3	792	3	672
4	102	4	059	4	996	4	912	4	810	4	690
5	122	5	078	5	7014	5	931	5	828	5	707
2246	3. 35141	2296	3. 36097	3346	3. 37033	2396	3. 37949	2446	3 38846	2496	3. 39724
7	160	7	116	7	051	7	967	7	863	7	741
8	180	8	135	8	070	8	985	8	881	8	759
9	199	9	154	9	088	9	8003	9	899	9	777
50	218	2300	173	50	107	2400	021	50	917	2500	794

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10.000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L.
2501	3. 39811	2551	3. 40671	2601	3. 41514	2651	3. 42341	2701	3. 43152	2751	3. 43949
2	829	2	688	2	531	2	357	2	169	2	965
3	846	3	705	3	547	3	374	3	185	3	981
4	864	4	722	4	564	4	390	4	201	4	996
5	881	5	739	5	581	5	406	5	217	5	4012
2506	3. 39898	2556	3. 40756	2606	3. 41597	2656	3. 42423	2706	3. 43233	2756	3. 44028
7	915	7	773	7	614	7	439	7	249	7	044
8	933	8	790	8	631	8	456	8	265	8	059
9	950	9	807	9	647	9	472	9	281	9	075
10	967	60	824	10	664	60	488	10	297	60	091
2511	3. 39985	2561	3. 40841	2611	3. 41681	2661	3. 42504	2711	3. 43313	2761	3. 44107
2	40002	2	858	2	697	2	521	2	329	2	122
3	019	3	875	3	714	3	537	3	345	3	138
4	037	4	892	4	731	4	553	4	361	4	154
5	054	5	909	5	747	5	570	5	377	5	170
2516	3. 40071	2566	3. 40926	2616	3. 41764	2666	3. 42586	2716	3. 43393	2766	3. 44185
7	088	7	943	7	780	7	602	7	409	7	201
8	106	8	960	8	797	8	619	8	425	8	217
9	123	9	976	9	814	9	635	9	441	9	232
20	140	70	993	20	830	70	651	20	457	70	248
2521	3. 40157	2571	3. 41010	2621	3. 41847	2671	3. 42667	2721	3. 43473	2771	3. 44264
2	175	2	027	2	863	2	684	2	489	2	279
3	192	3	044	3	880	3	700	3	505	3	295
4	209	4	061	4	896	4	716	4	521	4	311
5	226	5	078	5	913	5	732	5	537	5	326
2526	3. 40243	2576	3. 41095	2626	3. 41929	2676	3. 42749	2726	3. 43553	2776	3. 44342
7	261	7	111	7	946	7	765	7	569	7	358
8	278	8	128	8	963	8	781	8	584	8	373
9	295	9	145	9	979	9	797	9	600	9	389
30	312	80	162	30	996	80	813	30	616	80	404
2531	3. 40329	2581	3. 41179	2631	3. 42012	2681	3. 42830	2731	3. 43632	2781	3. 44420
2	346	2	196	2	029	2	846	2	648	2	436
3	364	3	212	3	045	3	862	3	664	3	451
4	381	4	229	4	062	4	878	4	680	4	467
5	398	5	246	5	078	5	894	5	696	5	483
2536	3. 40415	2586	3. 41263	2636	3. 42095	2686	3. 42911	2736	3. 43712	2786	3. 44498
7	432	7	280	7	111	7	927	7	727	7	514
8	449	8	296	8	127	8	943	8	743	8	529
9	466	9	313	9	144	9	959	9	759	9	545
40	483	90	330	40	160	90	975	40	775	90	560
2541	3. 40500	2591	3. 41347	2641	3. 42177	2691	3. 42991	2741	3. 43791	2791	3. 44576
2	518	2	364	2	193	2	3008	2	807	2	592
3	535	3	380	3	210	3	024	3	823	3	607
4	552	4	397	4	226	4	040	4	838	4	623
5	569	5	414	5	243	5	056	5	854	5	638
2546	3. 40586	2596	3. 41430	2646	3. 42259	2696	3. 43072	2746	3. 43870	2796	3. 44654
7	603	7	447	7	275	7	088	7	886	7	669
8	620	8	464	8	292	8	104	8	902	8	685
9	637	9	481	9	308	9	120	9	917	9	700
50	654	2600	497	50	325	2700	136	50	933	2800	716

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10,000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L.
2801	3. 44731	2851	3. 45500	2901	3. 46255	2951	3. 46997	3001	3. 47727	3051	3. 48444
2	747	2	515	2	270	2	7012	2	741	2	458
3	762	3	530	3	285	3	026	3	756	3	473
4	778	4	545	4	300	4	041	4	770	4	487
5	793	5	561	5	315	5	056	5	784	5	501
2806	3. 44809	2856	3. 45576	2906	3. 46330	2956	3. 47070	3006	3. 47799	3056	3. 48515
7	824	7	591	7	345	7	085	7	813	7	530
8	840	8	606	8	360	8	100	8	828	8	544
9	855	9	621	9	374	9	115	9	842	9	558
10	871	60	637	10	389	60	129	10	857	60	572
2811	3. 44886	2861	3. 45652	2911	3. 46404	2961	3. 47144	3011	3. 47871	3061	3. 48586
2	902	2	666	2	419	2	159	2	886	2	601
3	917	3	682	3	434	3	173	3	900	3	615
4	932	4	697	4	449	4	188	4	914	4	629
5	948	5	712	5	464	5	202	5	929	5	643
2816	3. 44963	2866	3. 45728	2916	3. 46479	2966	3. 47217	3016	3. 47943	3066	3. 48657
7	979	7	743	7	494	7	232	7	958	7	671
8	994	8	758	8	509	8	246	8	972	8	686
9	5010	9	773	9	523	9	261	9	986	9	700
20	025	70	788	20	538	70	276	20	8001	70	714
2821	3. 45040	2871	3. 45803	2921	3. 46553	2971	3. 47290	3021	3. 48015	3071	3. 48728
2	056	2	818	2	568	2	305	2	029	2	742
3	071	3	834	3	583	3	319	3	044	3	756
4	086	4	849	4	598	4	334	4	058	4	770
5	102	5	864	5	613	5	349	5	073	5	785
2826	3. 45117	2876	3. 45879	2926	3. 46627	2976	3. 47363	3026	3. 48087	3076	3. 48799
7	133	7	894	7	642	7	378	7	101	7	813
8	148	8	909	8	657	8	392	8	116	8	827
9	163	9	924	9	672	9	407	9	130	9	841
30	179	80	939	30	687	80	422	30	144	80	855
2831	3. 45194	2881	3. 45954	2931	3. 46702	2981	3. 47436	3031	3. 48159	3081	3. 48869
2	209	2	969	2	716	2	451	2	173	2	883
3	225	3	984	3	731	3	465	3	187	3	897
4	240	4	6000	4	746	4	480	4	202	4	911
5	255	5	015	5	761	5	494	5	216	5	926
2836	3. 45271	2886	3. 46030	2936	3. 46776	2986	3. 47509	3036	3. 48230	3086	3. 48940
7	286	7	045	7	790	7	524	7	244	7	953
8	301	8	060	8	805	8	538	8	259	8	968
9	317	9	075	9	820	9	553	9	273	9	982
40	332	90	090	40	835	90	567	40	287	90	996
2841	3. 45347	2891	3. 46105	2941	3. 46850	2991	3. 47582	3041	3. 48302	3091	3. 49010
2	362	2	120	2	867	2	596	2	316	2	024
3	378	3	135	3	879	3	611	3	330	3	038
4	393	4	150	4	894	4	625	4	344	4	052
5	408	5	165	5	909	5	640	5	359	5	066
2846	3. 45423	2896	3. 46180	2946	3. 46923	2996	3. 47654	3046	3. 48373	3096	3. 49080
7	439	7	195	7	938	7	669	7	387	7	094
8	454	8	210	8	953	8	683	8	402	8	108
9	469	9	225	9	967	9	698	9	416	9	122
50	484	2900	240	50	982	3000	712	50	430	3100	136

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10,000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L.
3101	3. 49150	3151	3. 49845	3201	3. 50529	3251	3. 51202	3301	3. 51865	3351	3. 52517
2	164	2	859	2	542	2	215	2	878	2	530
3	178	3	872	3	556	3	228	3	891	3	543
4	192	4	886	4	569	4	242	4	904	4	556
5	206	5	900	5	583	5	255	5	917	5	569
3106	3. 49220	3156	3. 49914	3206	3. 50596	3256	3. 51268	3306	3. 51930	3356	3. 52582
7	234	7	927	7	610	7	282	7	943	7	595
8	248	8	941	8	623	8	295	8	957	8	608
9	262	9	955	9	637	9	308	9	970	9	621
10	276	60	969	10	651	60	322	10	983	60	634
3111	3. 49290	3161	3. 49982	3211	3. 50664	3261	3. 51335	3311	3. 51996	3361	3. 52647
2	304	2	996	2	678	2	348	2	2009	2	660
3	318	3	50010	3	691	3	362	3	022	3	673
4	332	4	024	4	705	4	375	4	035	4	686
5	346	5	037	5	718	5	388	5	048	5	699
3116	3. 49360	3166	3. 50051	3216	3. 50732	3266	3. 51402	3316	3. 52061	3366	3. 52711
7	374	7	065	7	745	7	415	7	075	7	724
8	388	8	079	8	759	8	428	8	088	8	737
9	402	9	092	9	772	9	441	9	101	9	750
20	415	70	106	20	786	70	455	20	114	70	763
3121	3. 49429	3171	3. 50120	3221	3. 50799	3271	3. 51468	3321	3. 52127	3371	3. 52776
2	443	2	133	2	813	2	481	2	140	2	789
3	457	3	147	3	826	3	495	3	153	3	802
4	471	4	161	4	840	4	508	4	166	4	815
5	485	5	174	5	853	5	521	5	179	5	827
3126	3. 49499	3176	3. 50188	3226	3. 50866	3276	3. 51534	3326	3. 52192	3376	3. 52840
7	513	7	202	7	880	7	548	7	205	7	853
8	527	8	215	8	893	8	561	8	218	8	866
9	541	9	229	9	907	9	574	9	231	9	879
30	554	80	243	30	920	80	587	30	244	80	892
3131	3. 49568	3181	3. 50256	3231	3. 50934	3281	3. 51601	3331	3. 52257	3381	3. 52905
2	582	2	270	2	947	2	614	2	271	2	917
3	596	3	284	3	961	3	627	3	284	3	930
4	610	4	297	4	974	4	640	4	297	4	943
5	624	5	311	5	987	5	654	5	310	5	956
3136	3. 49638	3186	3. 50325	3236	3. 51001	3286	3. 51667	3336	3. 52323	3386	3. 52969
7	651	7	338	7	014	7	680	7	336	7	982
8	665	8	352	8	028	8	693	8	349	8	994
9	679	9	365	9	041	9	706	9	362	9	3007
40	693	90	379	40	055	90	720	40	375	90	020
3141	3. 49707	3191	3. 50393	3241	3. 51068	3291	3. 51733	3341	3. 52388	3391	3. 53033
2	721	2	406	2	081	2	746	2	401	2	046
3	734	3	420	3	095	3	759	3	414	3	058
4	748	4	433	4	108	4	772	4	427	4	071
5	762	5	447	5	121	5	786	5	440	5	084
3146	3. 49776	3196	3. 50461	3246	3. 51134	3296	3. 51799	3346	3. 52453	3396	3. 53097
7	790	7	474	7	148	7	812	7	466	7	110
8	803	8	488	8	162	8	825	8	479	8	122
9	817	9	501	9	175	9	838	9	492	9	135
50	831	3200	515	50	188	3300	851	50	504	3400	148

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10.000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L
3401	3. 53161	3451	3. 53795	3501	3. 54419	3551	3. 55035	3601	3. 55642	3651	3. 56241
2	173	2	807	2	432	2	047	2	654	2	253
3	186	3	820	3	444	3	060	3	666	3	265
4	199	4	832	4	456	4	072	4	678	4	277
5	212	5	845	5	469	5	084	5	691	5	289
3406	3. 53224	3456	3. 53857	3506	3. 54481	3556	3. 55096	3606	3. 55703	3656	3. 56301
7	237	7	870	7	494	7	108	7	715	7	313
8	250	8	883	8	506	8	121	8	727	8	324
9	263	9	895	9	518	9	133	9	739	9	336
10	275	60	908	10	531	60	145	10	751	60	348
3411	3. 53288	3461	3. 53920	3511	3. 54543	3561	3. 55157	3611	3. 55763	3661	3. 56360
2	301	2	933	2	555	2	169	2	775	2	372
3	314	3	945	3	568	3	182	3	787	3	384
4	326	4	958	4	580	4	194	4	799	4	396
5	339	5	970	5	593	5	206	5	811	5	407
3416	3. 53352	3466	3. 53983	3516	3. 54605	3566	3. 55218	3616	3. 55823	3666	3. 56419
7	365	7	995	7	617	7	230	7	835	7	431
8	377	8	4008	8	630	8	242	8	847	8	443
9	390	9	020	9	642	9	255	9	859	9	455
20	403	70	033	20	654	70	267	20	874	70	467
3421	3. 53415	3471	3. 54045	3521	3. 54667	3571	3. 55279	3621	3. 55883	3671	3. 56478
2	428	2	058	2	679	2	291	2	895	2	490
3	441	3	070	3	691	3	303	3	907	3	502
4	453	4	083	4	704	4	315	4	919	4	514
5	466	5	095	5	716	5	328	5	931	5	526
3426	3. 53479	3476	3. 54108	3526	3. 54728	3576	3. 55340	3626	3. 55943	3676	3. 56538
7	491	7	120	7	741	7	352	7	955	7	549
8	504	8	133	8	753	8	364	8	967	8	561
9	517	9	145	9	765	9	376	9	979	9	573
30	529	80	158	30	777	80	388	30	991	80	585
3431	3. 53542	3481	3. 54170	3531	3. 54790	3581	3. 55400	3631	3. 56003	3681	3. 56597
2	555	2	183	2	802	2	413	2	015	2	608
3	567	3	195	3	814	3	425	3	027	3	620
4	580	4	208	4	827	4	437	4	038	4	632
5	593	5	220	5	839	5	449	5	050	5	644
3436	3. 53605	3486	3. 54233	3536	3. 54851	3586	3. 55461	3636	3. 56062	3686	3. 56656
7	618	7	245	7	864	7	473	7	074	7	667
8	631	8	258	8	876	8	485	8	086	8	679
9	643	9	270	9	888	9	497	9	098	9	691
40	656	90	283	40	900	90	509	40	110	90	703
3441	3. 53668	3491	3. 54295	3541	3. 54913	3591	3. 55522	3641	3. 56122	3691	3. 56714
2	681	2	307	2	925	2	534	2	134	2	726
3	694	3	320	3	937	3	546	3	146	3	738
4	706	4	332	4	949	4	558	4	158	4	750
5	719	5	345	5	962	5	570	5	170	5	761
3446	3. 53732	3496	3. 54357	3546	3. 54974	3596	3. 55582	3646	3. 56182	3696	3. 56773
7	744	7	370	7	986	7	594	7	194	7	785
8	757	8	382	8	998	8	606	8	205	8	797
9	769	9	394	9	5011	9	618	9	217	9	808
50	782	3500	407	50	023	3600	630	50	229	3700	820

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10,000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L.
3701	3· 56832	3751	3· 57415	3801	3· 57990	3851	3· 58557	3901	3· 59118	3951	3· 59671
2	844	2	426	2	8001	2	569	2	129	2	682
3	855	3	438	3	013	3	580	3	140	3	693
4	867	4	449	4	024	4	591	4	151	4	704
5	879	5	461	5	035	5	602	5	162	5	715
3706	3· 56891	3756	3· 57473	3806	3· 58047	3856	3· 58614	3906	3· 59173	3956	3· 59726
7	902	7	484	7	058	7	625	7	184	7	737
8	914	8	496	8	070	8	636	8	195	8	748
9	926	9	507	19	081	9	647	9	207	9	759
10	937	60	519	10	093	60	659	10	218	60	770
3711	3· 56949	3761	3· 57530	3811	3· 58104	3861	3· 58670	3911	3· 59229	3961	3· 59780
2	961	2	542	2	115	2	681	2	240	2	791
3	972	3	553	13	127	3	692	3	251	3	802
4	984	4	565	4	138	4	704	4	262	4	813
5	996	5	577	5	149	5	715	5	273	5	824
3716	3· 57008	3766	3· 57588	3816	3· 58161	3866	3· 58726	3916	3· 59284	3966	3· 59835
7	019	7	600	7	172	7	737	7	295	7	846
8	031	8	611	8	184	8	749	8	306	8	857
9	043	9	623	9	195	9	760	9	318	9	868
20	054	70	634	20	206	70	771	20	329	70	879
3721	3· 57066	3771	3· 57646	3821	3· 58218	3871	3· 58782	3921	3· 59340	3971	3· 59890
2	078	2	657	2	229	2	794	2	351	2	901
3	089	3	669	3	240	3	805	3	362	3	912
4	101	4	680	4	252	4	816	4	373	4	923
5	113	5	692	5	263	5	827	5	384	5	934
3726	3· 57124	3776	3· 57703	3826	3· 58275	3876	3· 58838	3926	3· 59395	3976	3· 59945
7	136	7	715	7	286	7	850	7	406	7	956
8	148	8	726	8	297	8	861	8	417	8	966
9	159	9	738	9	309	9	872	9	428	9	977
30	171	80	749	30	320	80	883	30	439	80	978
3731	3· 57183	3781	3· 57761	3831	3· 58331	3881	3· 58894	3931	3· 59450	3981	3· 59999
2	194	2	772	2	343	2	906	2	461	2	60010
3	206	3	784	3	354	3	917	3	472	3	021
4	217	4	795	4	365	4	928	4	483	4	032
5	229	5	807	5	377	5	939	5	494	5	043
3736	3· 57241	3786	3· 57818	3836	3· 58388	3886	3· 58950	3936	3· 59506	3986	3· 60054
7	252	7	830	7	399	7	961	7	517	7	065
8	264	8	841	8	411	8	973	8	528	8	076
9	276	9	852	9	422	9	984	9	539	9	086
40	287	90	864	40	433	90	995	40	550	90	097
3741	3· 57299	3791	3· 57875	3841	3· 58444	3891	3· 59006	3941	3· 59561	3991	3· 60108
2	310	2	887	2	456	2	017	2	572	2	119
3	322	3	898	3	467	3	028	3	583	3	130
4	334	4	910	4	478	4	040	4	594	4	141
5	345	5	921	5	490	5	051	5	605	5	152
7346	3· 57357	3796	3· 57933	3846	3· 58501	3896	3· 59062	3946	3· 59016	3996	3· 60163
7	368	7	944	7	512	7	073	7	627	7	173
8	380	8	956	8	524	8	084	8	638	8	184
9	392	9	967	9	535	9	095	9	649	9	195
50	403	3800	978	50	546	3900	106	50	660	4000	206

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10,000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L.
4001	3. 60217	4051	3. 60756	4101	3. 61289	4151	3. 61815	4201	3. 62335	4251	3. 62849
2	228	2	767	2	300	2	826	2	346	2	859
3	239	3	778	3	310	3	836	3	356	3	870
4	249	4	788	4	321	4	847	4	366	4	880
5	260	5	799	5	331	5	857	5	377	5	890
4006	3. 60271	4056	3. 60810	4106	3. 61342	4156	3. 61868	4206	3. 62387	4256	3. 62900
7	282	7	821	7	352	7	878	7	397	7	910
8	293	8	831	8	363	8	888	8	408	8	921
9	304	9	842	9	374	9	899	9	418	9	931
10	314	60	853	10	384	60	909	10	428	60	941
4011	3. 60325	4061	3. 60863	4111	3. 61395	4161	3. 61920	4211	3. 62439	4261	3. 62951
2	336	2	874	2	405	2	930	2	449	2	961
3	347	3	885	3	416	3	941	3	459	3	972
4	358	4	895	4	426	4	951	4	469	4	982
5	369	5	906	5	437	5	962	5	480	5	992
4016	3. 60379	4066	3. 60917	4116	3. 61448	4166	3. 61972	4216	3. 62490	4266	3. 63002
7	390	7	927	7	458	7	982	7	500	7	012
8	401	8	938	8	469	8	993	8	511	8	022
9	412	9	949	9	479	9	2003	9	521	9	033
20	423	70	959	20	490	70	014	20	531	70	043
4021	3. 60433	4071	3. 60970	4121	3. 61500	4171	3. 62024	4221	3. 62542	4271	3. 63053
2	444	2	981	2	511	2	034	2	552	2	063
3	455	3	991	3	521	3	045	3	562	3	073
4	466	4	1002	4	532	4	055	4	572	4	083
5	477	5	013	5	542	5	066	5	583	5	094
4026	3. 60487	4076	3. 61023	4126	3. 61553	4176	3. 62076	4226	3. 62593	4276	3. 63104
7	498	7	034	7	563	7	086	7	603	7	114
8	509	8	045	8	574	8	097	8	614	8	124
9	520	9	055	9	584	9	107	9	624	9	134
30	531	80	066	30	595	80	118	30	634	80	144
4031	3. 60541	4081	3. 61077	4131	3. 61606	4181	3. 62128	4231	3. 62644	4281	3. 63155
2	552	2	087	2	616	2	138	2	655	2	165
3	563	3	098	3	627	3	149	3	665	3	175
4	574	4	109	4	637	4	159	4	675	4	185
5	584	5	119	5	648	5	170	5	685	5	195
4036	3. 60595	4086	3. 61130	4136	3. 61658	4186	3. 62180	4236	3. 62796	4286	3. 63205
7	606	7	140	7	669	7	190	7	706	7	215
8	617	8	151	8	679	8	201	8	716	8	225
9	627	9	162	9	690	9	211	9	726	9	236
40	638	90	172	40	700	90	221	40	737	90	246
4041	3. 60649	4091	3. 61183	4141	3. 61711	4191	3. 62232	4241	3. 62747	4291	3. 63256
2	660	2	194	2	721	2	242	2	757	2	266
3	670	3	204	3	731	3	252	3	767	3	276
4	681	4	215	4	742	4	263	4	778	4	286
5	692	5	22	5	752	5	273	5	788	5	296
4046	3. 60703	4096	3. 61236	4146	3. 61763	4196	3. 62284	4246	3. 62798	4296	3. 63306
7	713	7	247	7	773	7	294	7	808	7	317
8	724	8	257	8	784	8	304	8	818	8	327
9	735	9	268	9	794	9	315	9	829	9	337
50	746	4100	278	50	805	4200	325	50	839	4300	347

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10,000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L.
4301	3. 63357	4351	3. 63859	4401	3. 64355	4451	3. 64846	4501	3. 65331	4551	3. 65811
2	367	2	869	2	365	2	856	2	341	2	820
3	377	3	879	3	375	3	865	3	350	3	830
4	387	4	889	4	385	4	875	4	360	4	839
5	397	5	899	5	395	5	885	5	369	5	849
4306	3. 63407	4356	3. 63909	4406	3. 64404	4456	3. 64895	4506	3. 65379	4556	3. 65858
7	417	7	919	7	414	7	904	7	389	7	868
8	428	8	929	8	424	8	914	8	398	8	877
9	438	9	939	9	434	9	924	9	408	9	887
10	448	60	949	10	444	60	933	10	418	60	896
4311	3. 63458	4361	3. 63959	4411	3. 64454	4461	3. 64943	4511	3. 65427	4561	3. 65906
2	468	2	969	2	464	2	953	2	437	2	916
3	478	3	979	3	473	3	963	3	447	3	925
4	488	4	988	4	483	4	972	4	456	4	935
5	498	5	998	5	493	5	982	5	466	5	944
4316	3. 63508	4366	3. 64008	4416	3. 64503	4466	3. 64992	4516	3. 65475	4566	3. 65954
7	518	7	018	7	513	7	5002	7	485	7	963
8	528	8	028	8	523	8	011	8	495	8	973
9	538	9	038	9	532	9	021	9	504	9	982
20	548	70	048	20	542	70	031	20	514	70	992
4321	3. 63558	4371	3. 64058	4421	3. 64552	4471	3. 65040	4521	3. 65523	4571	3. 66001
2	568	2	068	2	562	2	050	2	533	2	011
3	579	3	078	3	572	3	060	3	543	3	020
4	589	4	088	4	582	4	070	4	552	4	030
5	599	5	098	5	591	5	079	5	562	5	039
4326	3. 63609	4376	3. 64108	4426	3. 64601	4476	3. 65089	4526	3. 65571	4576	3. 66049
7	619	7	118	7	611	7	099	7	581	7	058
8	629	8	128	8	621	8	108	8	591	8	068
9	639	9	137	9	631	9	118	9	600	9	077
30	649	80	147	30	640	80	128	30	610	80	087
4331	3. 63659	4381	3. 64157	4431	3. 64650	4481	3. 65137	4531	3. 65619	4581	3. 66096
2	669	2	167	2	660	2	147	2	629	2	106
3	679	3	177	3	670	3	157	3	639	3	115
4	689	4	187	4	680	4	167	4	648	4	124
5	699	5	197	5	689	5	176	5	658	5	134
4336	3. 63709	4386	3. 64207	4436	3. 64699	4486	3. 65186	4536	3. 65667	4586	3. 66143
7	719	7	217	7	709	7	196	7	677	7	153
8	729	8	227	8	719	8	205	8	686	8	162
9	739	9	237	9	729	9	215	9	696	9	172
40	749	90	246	40	738	90	225	40	706	90	181
4341	3. 63759	4391	3. 64256	4441	3. 64748	4491	3. 65234	4541	3. 65715	4591	3. 66191
2	769	2	266	2	758	2	244	2	725	2	200
3	779	3	276	3	768	3	254	3	734	3	210
4	789	4	286	4	777	4	263	4	744	4	219
5	799	5	296	5	787	5	273	5	753	5	229
4346	3. 63809	4396	3. 64306	4446	3. 64797	4496	3. 65283	4546	3. 65763	4596	3. 66238
7	819	7	316	7	807	7	292	7	773	7	247
8	829	8	326	8	816	8	302	8	782	8	257
9	839	9	335	9	826	9	312	9	792	9	266
50	849	4300	345	50	836	4500	321	50	801	4600	276

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10.000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L
4601	3. 66285	4651	3. 66755	4701	3. 67219	4751	3. 67679	4801	3. 68133	4851	3. 68583
2	295	2	764	2	228	2	688	2	142	2	592
3	304	3	773	3	238	3	697	3	151	3	601
4	314	4	783	4	247	4	706	4	160	4	610
5	323	5	792	5	256	5	715	5	169	5	619
4606	3. 66332	4656	3. 66801	4706	3. 67265	4756	3. 67724	4806	3. 68178	4856	3. 68628
7	342	7	811	7	274	7	733	7	187	7	637
8	351	8	820	8	284	8	742	8	196	8	646
9	361	9	829	9	293	9	752	9	205	9	655
10	370	60	839	10	302	60	761	10	215	60	664
4611	3. 66380	4661	3. 66848	4711	3. 67311	4761	3. 67770	4811	3. 68224	4861	3. 68673
2	389	2	857	2	321	2	779	2	233	2	682
3	398	3	867	3	330	3	788	3	242	3	690
4	408	4	876	4	339	4	797	4	251	4	699
5	417	5	885	5	348	5	806	5	260	5	708
4616	3. 66427	4666	3. 66894	4716	3. 67357	4766	3. 67815	4816	3. 68269	4866	3. 68717
7	436	7	904	7	367	7	825	7	278	7	726
8	445	8	913	8	376	8	834	8	287	8	735
9	455	9	922	9	385	9	843	9	296	9	744
20	464	70	932	20	394	70	852	20	305	70	753
4621	3. 66474	4671	3. 66941	4721	3. 67403	4771	3. 67861	4821	3. 68314	4871	3. 68762
2	483	2	950	2	413	2	870	2	323	2	771
3	492	3	960	3	422	3	879	3	332	3	780
4	502	4	969	4	431	4	888	4	341	4	789
5	511	5	978	5	440	5	897	5	350	5	797
4626	3. 66521	4676	3. 66987	4726	3. 67449	4776	3. 67906	4826	3. 68359	4876	3. 68806
7	530	7	997	7	459	7	916	7	368	7	815
8	539	8	7006	8	468	8	925	8	377	8	824
9	549	9	015	9	477	9	934	9	386	9	833
30	558	80	025	30	486	80	943	30	395	80	842
4631	3. 66567	4681	3. 67034	4731	3. 67495	4781	3. 67952	4831	3. 68404	4881	3. 68851
2	577	2	043	2	504	2	961	2	413	2	860
3	586	3	052	3	514	3	970	3	422	3	869
4	596	4	062	4	523	4	979	4	431	4	878
5	605	5	071	5	532	5	988	5	440	5	886
4636	3. 66614	4686	3. 67080	4736	3. 67541	4786	3. 67997	4836	3. 68449	4886	3. 68895
7	624	7	090	7	550	7	8006	7	458	7	904
8	633	8	099	8	560	8	015	8	467	8	913
9	642	9	108	9	569	9	024	9	476	9	922
40	652	90	117	40	578	90	034	40	485	90	931
4641	3. 66661	4691	3. 67127	4741	3. 67587	4791	3. 68043	4841	3. 68494	4891	3. 68940
2	671	2	136	2	596	2	052	2	502	2	949
3	680	3	145	3	605	3	061	3	511	3	958
4	689	4	154	4	614	4	070	4	520	4	966
5	699	5	164	5	624	5	079	5	529	5	975
4646	3. 66708	4696	3. 67173	4746	3. 67633	4796	3. 68088	4846	3. 68538	4896	3. 68984
7	717	7	182	7	642	7	097	7	547	7	993
8	727	8	191	8	651	8	106	8	556	8	9002
9	736	9	201	9	660	9	115	9	565	9	011
50	745	4700	210	50	669	4800	124	50	574	4900	020

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10.000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L.
4901	3. 69028	4951	3. 69469	5001	3. 69906	5051	3. 70338	5101	3. 70766	5151	3. 71189
2	037	2	478	2	914	2	346	2	774	2	198
3	046	3	487	3	923	3	355	3	783	3	206
4	055	4	496	4	932	4	364	4	791	4	214
5	064	5	504	5	940	5	372	5	800	5	223
4906	3. 69073	4956	3. 69513	5006	3. 69949	5056	3. 70381	5106	3. 70808	5156	3. 71231
7	082	7	522	7	958	7	389	7	817	7	240
8	091	8	531	8	966	8	398	8	825	8	248
9	099	9	539	9	975	9	406	9	834	9	257
10	108	60	548	10	984	60	415	10	842	60	265
4911	3. 69117	4961	3. 69557	5011	3. 69992	5061	3. 70423	5111	3. 70851	5161	3. 71273
2	126	2	566	2	70001	2	432	2	859	2	282
3	135	3	574	3	010	3	441	3	868	3	290
4	144	4	583	4	018	4	449	4	876	4	299
5	152	5	592	5	027	5	458	5	885	5	307
4916	3. 69161	4966	3. 69601	5016	3. 70036	5066	3. 70467	5116	3. 70893	5166	3. 71315
7	170	7	609	7	044	7	475	7	902	7	324
8	179	8	618	8	053	8	484	8	910	8	332
9	188	9	627	9	062	9	492	9	919	9	341
20	197	70	636	20	070	70	501	20	927	70	349
4921	3. 69205	4971	3. 69644	5021	3. 70079	5071	3. 70509	5121	3. 70935	5171	3. 71357
2	214	2	653	2	088	2	518	2	944	2	366
3	223	3	662	3	096	3	526	3	952	3	374
4	232	4	671	4	105	4	535	4	961	4	383
5	241	5	679	5	114	5	544	5	969	5	391
4926	3. 69249	4976	3. 69688	5026	3. 70122	5076	3. 70552	5126	3. 70978	5176	3. 71399
7	258	7	697	7	131	7	561	7	986	7	408
8	267	8	705	8	140	8	569	8	995	8	416
9	276	9	714	9	148	9	578	9	1003	9	425
30	285	80	723	30	157	80	586	30	012	80	433
4931	3. 69294	4981	3. 69732	5031	3. 70165	5081	3. 70595	5131	3. 71020	5181	3. 71441
2	302	2	740	2	174	2	603	2	029	2	450
3	311	3	749	3	183	3	612	3	037	3	458
4	320	4	758	4	191	4	621	4	046	4	467
5	329	5	767	5	200	5	629	5	054	5	475
4936	3. 69338	4986	3. 69775	5036	3. 70209	5086	3. 70638	5136	3. 71063	5186	3. 71483
7	346	7	784	7	217	7	646	7	071	7	492
8	355	8	793	8	226	8	655	8	079	8	500
9	364	9	801	9	234	9	663	9	088	9	508
40	373	90	810	40	243	90	672	40	006	90	517
4991	3. 69381	4991	3. 69819	5041	3. 70252	5091	3. 70680	5141	3. 71105	5191	3. 71525
2	390	2	827	2	260	2	689	2	113	2	533
3	399	3	836	3	269	3	697	3	122	3	542
4	408	4	845	4	278	4	706	4	130	4	550
5	417	5	854	5	286	5	714	5	139	5	559
4946	3. 69425	4996	3. 69862	5046	3. 70295	5096	3. 70723	5146	3. 71147	5196	3. 71567
7	434	7	871	7	303	7	731	7	155	7	575
8	443	8	880	8	312	8	740	8	164	8	584
9	452	9	888	9	321	9	749	9	172	9	592
50	461	5000	897	50	329	5100	757	50	181	5200	600

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10,000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L.
5201	3. 71609	5251	3. 72024	5301	3. 72436	5351	3. 72843	5401	3. 73247	5451	3. 73648
2	617	2	032	2	444	2	852	2	255	2	656
3	625	3	041	3	452	3	860	3	264	3	664
4	634	4	049	4	460	4	868	4	272	4	672
5	642	5	057	5	469	5	876	5	280	5	679
5206	3. 71650	5256	3. 72066	5306	3. 72477	5356	3. 72884	5406	3. 73288	5456	3. 73687
7	659	7	074	7	485	7	892	7	296	7	695
8	667	8	082	8	493	8	900	8	304	8	703
9	675	9	090	9	501	9	908	9	312	9	711
10	684	60	099	10	509	60	916	10	320	60	719
5211	3. 71692	5261	3. 72107	5311	3. 72518	5361	3. 72925	5411	3. 73328	5461	3. 73727
2	700	2	115	2	526	2	933	2	336	2	735
3	709	3	123	3	534	3	941	3	344	3	743
4	717	4	132	4	542	4	949	4	352	4	751
5	725	5	140	5	550	5	957	5	360	5	759
5216	3. 71734	5266	3. 72148	5316	3. 72559	5366	3. 72965	5416	3. 73368	5466	3. 73767
7	742	7	156	7	567	7	973	7	376	7	775
8	750	8	165	8	575	8	981	8	384	8	783
9	759	9	173	9	583	9	989	9	392	9	791
20	767	70	181	20	591	70	997	20	400	70	799
5221	3. 71775	5271	3. 72189	5321	3. 72599	5371	3. 73000	5421	3. 73408	5471	3. 73807
2	784	2	198	2	607	2	014	2	416	2	815
3	792	3	206	3	616	3	022	3	424	3	823
4	800	4	214	4	624	4	030	4	432	4	830
5	809	5	222	5	632	5	038	5	440	5	838
5226	3. 71817	5276	3. 72230	5326	3. 72640	5376	3. 73046	5426	3. 73448	5476	3. 73846
7	825	7	239	7	648	7	054	7	456	7	854
8	834	8	247	8	656	8	062	8	464	8	862
9	842	9	255	9	665	9	070	9	472	9	870
30	850	80	263	30	673	80	078	30	480	80	878
5231	3. 71858	5281	3. 72272	5331	3. 72681	5381	3. 73086	5431	3. 73488	5481	3. 73886
2	867	2	280	2	689	2	094	2	496	2	894
3	875	3	288	3	697	3	102	3	504	3	902
4	883	4	296	4	705	4	111	4	512	4	910
5	892	5	305	5	713	5	119	5	520	5	918
5236	3. 71900	5286	3. 72313	5336	3. 72722	5386	3. 73127	5436	3. 73528	5486	3. 73926
7	908	7	321	7	730	7	135	7	536	7	934
8	917	8	329	8	738	8	143	8	544	8	941
9	925	9	337	9	746	9	151	9	552	9	949
40	933	90	347	40	754	90	159	40	560	90	957
5241	3. 71941	5291	3. 72354	5341	3. 72762	5391	3. 73167	5441	3. 73568	5491	3. 73965
2	950	2	362	2	770	2	175	2	576	2	973
3	958	3	370	3	779	3	183	3	584	3	981
4	966	4	378	4	787	4	191	4	592	4	989
5	975	5	387	5	795	5	199	5	600	5	997
5246	3. 71983	5296	3. 72395	5346	3. 72803	5396	3. 73207	5446	3. 73608	5496	3. 74005
7	991	7	403	7	811	7	215	7	616	7	013
8	999	8	411	8	819	8	223	8	624	8	020
9	2008	9	419	9	827	9	231	9	632	9	028
50	016	5300	428	50	835	5400	239	50	640	5500	036

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10,000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L.
5501	3. 74044	5551	3. 74437	5601	3. 74827	5651	3. 75213	5701	3. 75595	5751	3. 75974
2	052	2	445	2	834	2	220	2	603	2	982
3	060	3	453	3	842	3	228	3	610	3	989
4	068	4	461	4	850	4	236	4	618	4	997
5	076	5	468	5	858	5	243	5	626	5	6005
5506	3. 74084	5556	3. 74476	5606	3. 74865	5656	3. 75251	5706	3. 75633	5756	3. 76012
7	092	7	484	7	873	7	259	7	641	7	020
8	099	8	492	8	881	8	266	8	648	8	027
9	107	9	500	9	889	9	274	9	656	9	035
10	115	60	507	10	896	60	282	10	664	60	042
5511	3. 74123	5561	3. 74515	5611	3. 74904	5661	3. 75289	5711	3. 75671	5761	3. 76050
2	131	2	523	2	912	2	297	2	679	2	057
3	139	3	531	3	920	3	305	3	686	3	065
4	147	4	539	4	927	4	312	4	694	4	072
5	155	5	547	5	935	5	320	5	702	5	080
5516	3. 74162	5566	3. 74554	5616	3. 74943	5666	3. 75328	5716	3. 75709	5766	3. 76087
7	170	7	562	7	950	7	335	7	717	7	095
8	178	8	570	8	958	8	343	8	724	8	103
9	186	9	578	9	966	9	351	9	732	9	110
20	194	70	586	20	974	70	358	20	740	70	118
5521	3. 74202	5571	3. 74593	5621	3. 74981	5671	3. 75366	5721	3. 75747	5771	3. 76125
2	210	2	601	2	989	2	374	2	755	2	133
3	218	3	609	3	997	3	381	3	762	3	140
4	225	4	617	4	5005	4	389	4	770	4	148
5	233	5	624	5	012	5	397	5	778	5	155
5526	3. 74241	5576	3. 74632	5626	3. 75020	5676	3. 75404	5726	3. 75785	5776	3. 76163
7	249	7	640	7	028	7	412	7	793	7	170
8	25[illegible]	8	648	8	035	8	420	8	800	8	178
9	265	9	656	9	043	9	427	9	808	9	185
30	273	80	663	30	051	80	435	30	815	80	193
5531	3. 74280	5581	3. 74671	5631	3. 75059	5681	3. 75442	5731	3. 75823	5781	3. 76200
2	288	2	679	2	066	2	450	2	831	2	208
3	296	3	687	3	074	3	458	3	838	3	215
4	304	4	695	4	082	4	465	4	846	4	223
5	312	5	702	5	089	5	473	5	853	5	230
5536	3. 74320	5586	3. 74710	5636	3. 75097	5686	3. 75481	5736	3. 75861	5786	3. 76238
7	327	7	718	7	105	7	488	7	868	7	245
8	335	8	726	8	113	8	496	8	876	8	253
9	343	9	733	9	120	9	504	9	884	9	260
40	351	90	741	40	128	90	511	40	891	90	268
5541	3. 74359	5591	3. 74749	5641	3. 75136	5691	3. 75519	7541	3. 75899	5791	3. 76275
2	367	2	757	2	143	2	526	2	906	2	283
3	374	3	764	3	151	3	534	3	914	3	290
4	382	4	772	4	159	4	542	4	921	4	298
5	390	5	780	5	166	5	549	5	929	5	305
5546	3. 74398	5596	3. 74788	5646	3. 75174	5696	3. 75557	5746	3. 75937	5796	3. 76313
7	406	7	796	7	182	7	565	7	944	7	320
8	414	8	803	8	189	8	572	8	952	8	328
9	421	9	811	9	197	9	58[illegible]	9	959	9	335
50	429	5600	819	50	205	5700	587	50	967	5800	343

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10.000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L.
5801	3. 76350	5851	3. 76723	5901	3. 77093	5951	3. 77459	6001	3. 77822	6051	3. 78183
2	358	2	730	2	100	2	466	2	830	2	190
3	365	3	738	3	107	3	474	3	837	3	197
4	373	4	745	4	115	4	481	4	844	4	204
5	380	5	753	5	122	5	488	5	851	5	211
5806	3. 76388	5856	3. 76760	5906	3. 77129	5956	3. 77495	6006	3. 77859	6056	3. 78219
7	395	7	768	7	137	7	503	7	866	7	226
8	403	8	775	8	144	8	510	8	873	8	233
9	410	9	782	9	151	9	517	9	880	9	240
10	418	60	790	10	159	60	525	10	887	60	247
5811	3. 76425	5861	3. 76797	5911	3. 77166	5961	3. 77532	6011	3. 77895	6061	3. 78254
2	433	2	805	2	173	2	539	2	902	2	262
3	440	3	812	3	181	3	546	3	909	3	269
4	448	4	819	4	188	4	554	4	916	4	276
5	455	5	827	5	195	5	561	5	924	5	283
5816	3. 76462	5866	3. 76834	5916	3. 77203	5966	3. 77568	6016	3. 77931	6066	3. 78290
7	470	7	842	7	210	7	576	7	938	7	297
8	477	8	849	8	218	8	583	8	945	8	305
9	485	9	856	9	225	9	590	9	952	9	312
20	492	70	864	20	232	70	597	20	960	70	319
5821	3. 76500	5871	3. 76871	5921	3. 77240	5971	3. 77605	6021	3. 77967	6071	3. 78326
2	507	2	879	2	247	2	612	2	974	2	333
3	515	3	886	3	254	3	619	3	981	3	340
4	522	4	893	4	262	4	627	4	989	4	347
5	530	5	901	5	269	5	634	5	996	5	355
5826	3. 76537	5876	3. 76908	5926	3. 77276	5976	3. 77641	6026	3. 78003	6076	3. 78362
7	545	7	916	7	283	7	648	7	010	7	369
8	552	8	923	8	291	8	656	8	017	8	376
9	559	9	930	9	298	9	663	9	025	9	383
30	567	80	938	30	305	80	670	30	032	80	390
5831	3. 76574	5881	3. 76945	5931	3. 77313	5981	3. 77677	6031	3. 78039	6081	3. 78398
2	582	2	953	2	320	2	685	2	046	2	405
3	589	3	960	3	327	3	692	3	053	3	412
4	597	4	967	4	335	4	699	4	061	4	419
5	604	5	975	5	342	5	706	5	068	5	426
5836	3. 76612	5886	3. 76982	5936	3. 77349	5986	3. 77714	6036	3. 78075	6086	3. 78433
7	619	7	989	7	357	7	721	7	082	7	440
8	626	8	997	8	364	8	728	8	089	8	447
9	634	9	7004	9	371	9	735	9	097	9	455
40	641	90	012	40	379	90	743	40	104	90	462
5841	3. 76649	5891	3. 77019	5941	3. 77386	5991	3. 77750	6041	3. 78110	6091	3. 78469
2	656	2	026	2	393	2	757	2	118	2	476
3	664	3	034	3	401	3	764	3	125	3	483
4	671	4	041	4	408	4	772	4	132	4	490
5	678	5	048	5	415	5	779	5	140	5	497
5846	3. 76686	5896	3. 77056	5946	3. 77422	5996	3. 777 8	6046	3. 78147	6096	3. 78505
7	693	7	063	7	430	7	793	7	154	7	512
8	701	8	070	8	437	8	801	8	161	8	519
9	708	9	078	9	444	9	808	9	168	9	526
50	716	5900	085	50	452	6000	815	50	176	6100	533

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10,000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L.
6101	3. 78540	6151	3. 78895	6201	3. 79246	6251	3. 79595	6301	3. 79941	6351	3. 80284
2	547	2	902	2	253	2	602	2	948	2	291
3	554	3	909	3	260	3	609	3	955	3	298
4	561	4	916	4	267	4	616	4	962	4	305
5	569	5	923	5	274	5	623	5	968	5	312
6106	3. 78576	6156	3. 78930	6206	3. 79281	6256	3. 79630	6306	3. 79975	6356	3. 80318
7	583	7	937	7	288	7	637	7	982	7	325
8	590	8	944	8	295	8	644	8	989	8	332
9	597	9	951	9	302	9	650	9	996	9	339
10	604	60	958	10	309	60	657	10	80003	60	346
6111	3. 78611	6161	3. 78965	6211	3. 79316	6261	3. 79664	6311	3. 80010	6361	3. 80353
2	618	2	972	2	323	2	671	2	017	2	359
3	625	3	979	3	330	3	678	3	024	3	366
4	633	4	986	4	337	4	685	4	030	4	373
5	640	5	993	5	344	5	692	5	037	5	380
6116	3. 78647	6166	3. 79000	6216	3. 79351	6266	3. 79699	6316	3. 80044	6366	3. 80387
7	654	7	007	7	358	7	706	7	051	7	393
8	661	8	014	8	365	8	713	8	058	8	400
9	668	9	021	9	372	9	720	9	065	9	407
20	675	70	029	20	379	70	727	20	072	70	414
6121	3. 78682	6171	3. 79036	6221	3. 79386	6271	3. 79734	6321	3. 80079	6371	3. 80421
2	689	2	043	2	393	2	741	2	085	2	428
3	696	3	050	3	400	3	748	3	092	3	434
4	704	4	057	4	407	4	754	4	099	4	441
5	711	5	064	5	414	5	761	5	106	5	448
6126	3. 78718	6176	3. 79071	6226	3. 79421	6276	3. 79768	6326	3. 80113	6376	3. 80455
7	725	7	078	7	428	7	775	7	120	7	462
8	732	8	085	8	432	8	782	8	127	8	468
9	739	9	092	9	442	9	789	9	134	9	475
30	746	80	099	30	449	80	796	30	140	80	482
6131	3. 78753	6181	3. 79106	6231	3. 79456	6281	3. 79803	6331	3. 80147	6381	3. 80489
2	760	2	113	2	463	2	810	2	154	2	496
3	767	3	120	3	470	3	817	3	161	3	502
4	774	4	127	4	477	4	824	4	168	4	509
5	781	5	134	5	484	5	831	5	175	5	516
6136	3. 78789	6186	3. 79141	6236	3. 79491	6286	3. 79837	6336	3. 80182	6386	3. 80523
7	796	7	148	7	498	7	844	7	188	7	530
8	803	8	155	8	505	8	851	8	195	8	536
9	810	9	162	9	512	9	858	9	202	9	543
40	817	90	169	40	518	90	865	40	209	90	550
6141	3. 78824	6191	3. 79176	6241	3. 79525	6291	3. 79872	6341	3. 80216	6391	3. 80557
2	831	2	183	2	532	2	879	2	223	2	564
3	838	3	190	3	539	3	886	3	229	3	570
4	845	4	197	4	546	4	893	4	236	4	577
5	852	5	204	5	553	5	900	5	243	5	584
6146	3. 78859	6196	3. 79211	6246	3. 79560	6296	3. 79906	6346	3. 80250	9396	3. 80591
7	866	7	218	7	567	7	913	7	257	7	598
8	873	8	225	8	574	8	920	8	264	8	604
9	880	9	232	9	581	9	927	9	271	9	611
50	888	6200	239	50	588	6300	934	50	277	6400	618

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10.000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L
6401	3. 80625	6451	3. 80963	6501	3. 81298	6551	3. 81631	6601	3. 81961	6651	3. 82289
2	632	2	969	2	305	2	637	2	968	2	295
3	638	3	976	3	311	3	644	3	974	3	302
4	645	4	983	4	318	4	651	4	981	4	308
5	652	5	990	5	325	5	657	5	987	5	315
6406	3. 80659	6456	3. 80996	6506	3. 81331	6556	3. 81664	6606	3. 81994	6656	3. 82321
7	665	7	1003	7	338	7	671	7	2000	7	328
8	672	8	010	8	345	8	677	8	007	8	334
9	679	9	017	9	351	9	684	9	[illegible]	9	341
10	686	60	023	10	358	60	690	10	020	60	347
6411	3. 80693	6461	3. 81030	6511	3. 81365	6561	3. 81697	6611	3. 82027	6661	3. 82354
2	699	2	037	2	371	2	704	2	033	2	360
3	706	3	043	3	378	3	710	3	040	3	367
4	713	4	050	4	385	4	717	4	046	4	374
5	720	5	057	5	391	5	723	5	053	5	380
6416	3. 80726	6466	3. 81064	6516	3. 81398	6566	3. 81730	6616	3. 82060	6666	3. 82387
7	733	7	070	7	405	7	737	7	066	7	393
8	740	8	077	8	411	8	743	8	073	8	400
9	747	9	084	9	418	9	750	9	079	9	406
20	754	70	090	20	425	70	757	20	086	70	413
6421	3. 80760	6471	3. 81097	6521	3. 81431	6571	3. 81763	6621	3. 82092	6671	3. 82419
2	767	2	104	2	438	2	770	2	099	2	426
3	774	3	111	3	445	3	776	3	105	3	432
4	781	4	117	4	451	4	783	4	112	4	439
5	787	5	124	5	458	5	790	5	119	5	445
6426	3. 80794	6476	3. 81131	6526	3. 81465	6576	3. 81796	6626	3. 82125	6676	3. 82452
7	801	7	137	7	471	7	803	7	132	7	458
8	808	8	144	8	478	8	809	8	138	8	465
9	814	9	151	9	485	9	816	9	145	9	471
30	821	80	158	30	491	80	823	30	151	80	478
6431	3. 80828	6481	3. 81164	6531	3. 81498	6581	3. 81829	6631	3. 82158	6681	3. 82484
2	835	2	171	2	505	2	836	2	164	2	491
3	841	3	178	3	511	3	842	3	171	3	497
4	848	4	184	4	518	4	849	4	178	4	504
5	855	5	191	5	525	5	856	5	184	5	510
6436	3. 80862	6486	3. 81198	6536	3. 81531	6586	3. 81862	6636	3. 82191	6686	3. 82517
7	868	7	204	7	538	7	869	7	197	7	523
8	875	8	211	8	544	8	875	8	204	8	530
9	882	9	218	9	551	9	882	9	210	9	536
40	889	90	224	40	558	90	889	40	217	90	543
6441	3. 80895	6491	3. 81231	6541	3. 81564	6591	3. 81895	6641	3. 82223	6691	3. 82549
2	902	2	238	2	571	2	902	2	230	2	556
3	909	3	245	3	578	3	908	3	236	3	562
4	916	4	251	4	584	4	915	4	243	4	569
5	922	5	258	5	591	5	921	5	250	5	575
6446	3. 80929	6496	3. 81265	6546	3. 81598	6596	3. 81928	6646	3. 82256	6696	3. 82582
7	936	7	271	7	604	7	935	7	263	7	588
8	943	8	278	8	611	8	941	8	269	8	595
9	949	9	285	9	618	9	948	9	276	9	601
50	956	6500	291	50	624	6600	954	50	282	6700	607

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10,000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L.
6701	3. 82614	6751	3. 82937	6801	3. 83257	6851	3. 83575	6901	3. 83891	6951	3. 84205
2	620	2	943	2	264	2	582	2	898	2	211
3	627	3	950	3	270	3	588	3	904	3	217
4	633	4	956	4	276	4	594	4	910	4	223
5	640	5	963	5	283	5	601	5	916	5	230
6706	3. 82646	6756	3. 82969	6806	3. 83289	6856	3. 83607	6906	3. 83923	6956	3. 84236
7	653	7	975	7	296	7	613	7	929	7	242
8	659	8	982	8	302	8	620	8	935	8	248
9	666	9	988	9	308	9	626	9	942	9	255
10	672	60	995	10	315	60	632	10	948	60	261
6711	3. 82679	6761	3. 83001	6811	3. 83321	6861	3. 83639	6911	3. 83954	6961	3. 84267
2	685	2	008	2	327	2	645	2	960	2	273
3	692	3	014	3	334	3	651	3	967	3	280
4	698	4	020	4	340	4	658	4	973	4	286
5	705	5	027	5	347	5	664	5	979	5	292
6716	3. 82711	6766	3. 83033	6816	3. 83353	6866	3. 83670	6916	3. 83986	6966	3. 84298
7	718	7	040	7	359	7	677	7	992	7	305
8	724	8	046	8	366	8	683	8	998	8	311
9	730	9	052	9	372	9	689	9	4004	9	317
20	737	70	059	20	378	70	696	20	011	70	323
6721	3. 82743	6771	3. 83065	6821	3. 83385	6871	3. 83702	6921	3. 84017	6971	3. 84330
2	750	2	072	2	391	2	708	2	023	2	336
3	756	3	078	3	398	3	715	3	029	3	342
4	763	4	085	4	404	4	721	4	036	4	348
5	769	5	091	5	410	5	727	5	042	5	354
6726	3. 82776	6776	3. 83097	6826	3. 83417	6876	3. 83734	6926	3. 84048	6976	3. 84361
7	782	7	104	7	423	7	740	7	055	7	367
8	789	8	110	8	429	8	746	8	061	8	373
9	795	9	117	9	436	9	753	9	067	9	379
30	802	80	123	30	442	80	759	30	073	80	386
6731	3. 82808	6781	3. 83129	6831	3. 83448	6881	3. 83765	6931	3. 84080	6981	3. 84392
2	814	2	136	2	455	2	771	2	086	2	398
3	821	3	142	3	461	3	778	3	092	3	404
4	827	4	149	4	468	4	784	4	098	4	410
5	834	5	155	5	474	5	790	5	105	5	417
6736	3. 82840	6786	3. 83161	6836	3. 83480	6886	3. 83797	6936	3. 84111	6986	3. 84423
7	847	7	168	7	487	7	803	7	117	7	429
8	853	8	174	8	493	8	809	8	123	8	435
9	860	9	181	9	499	9	816	9	130	9	442
40	866	90	187	40	506	90	822	40	136	90	448
6741	3. 82872	6791	3. 83193	6841	3. 83512	6891	3. 83828	6941	3. 84142	6991	3. 84454
2	879	2	200	2	518	2	835	2	148	2	460
3	885	3	206	3	525	3	841	3	155	3	466
4	892	4	213	4	531	4	847	4	161	4	473
5	898	5	219	5	537	5	853	5	167	5	479
6746	3. 82905	6796	3. 83225	8646	3. 83544	6896	3. 83860	6946	3. 84173	6996	3. 84485
7	911	7	232	7	550	7	866	7	180	7	491
8	918	8	238	8	556	8	872	8	186	8	497
9	924	9	245	9	563	9	879	9	192	9	504
50	930	6800	251	50	569	6900	885	50	199	7000	510

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10,000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L.
7001	3. 84516	7051	3. 84825	7101	3. 85132	7151	3. 85437	7201	3. 85739	7251	3. 86040
2	522	2	831	2	138	2	443	2	745	2	046
3	528	3	837	3	144	3	449	3	751	3	052
4	535	4	844	4	150	4	455	4	757	4	058
5	541	5	850	5	156	5	461	5	763	5	064
7006	3. 84547	7056	3. 84856	7106	3. 85163	7156	3. 85467	7206	3. 85769	7256	3. 86070
7	553	7	862	7	169	7	473	7	775	7	076
8	559	8	868	8	175	8	479	8	781	8	082
9	566	9	874	9	181	9	485	9	788	9	088
10	572	60	880	10	187	60	491	10	794	60	094
7011	3. 84578	7061	3. 84887	7111	3. 85193	7161	3. 85497	7211	3. 85800	7261	3. 86100
2	584	2	893	2	199	2	503	2	806	2	106
3	590	3	899	3	205	3	509	3	812	3	112
4	597	4	905	4	211	4	516	4	818	4	118
5	603	5	911	5	217	5	522	5	824	5	124
7016	3 84609	7066	3. 84917	7116	3. 85224	7166	3. 85528	7216	3. 85830	7266	3. 86130
7	615	7	924	7	230	7	534	7	836	7	136
8	621	8	930	8	236	8	540	8	842	8	141
9	628	9	936	9	242	9	546	9	848	9	147
20	634	70	942	20	248	70	552	20	854	70	153
7021	3. 84640	7071	3. 84948	7121	3. 85254	7171	3. 85558	7221	3. 85860	7271	3. 86159
2	646	2	954	2	260	2	564	2	866	2	165
3	652	3	960	3	266	3	570	3	872	3	171
4	658	4	967	4	272	4	576	4	878	4	177
5	665	5	973	5	278	5	582	5	884	5	183
7026	3. 84671	7076	3. 84979	7126	3. 85285	7176	3. 85588	7226	3. 85890	7276	3. 86189
7	677	7	985	7	291	7	594	7	896	7	195
8	683	8	991	8	297	8	600	8	902	8	201
9	689	9	907	9	303	9	606	9	908	9	207
30	696	80	5003	30	309	80	612	30	914	80	213
7031	3. 84702	7081	3. 85009	7131	3. 85315	7181	3. 85618	7231	3. 85920	7281	3. 86219
2	708	2	016	2	321	2	625	2	926	2	225
3	714	3	022	3	327	3	631	3	932	3	231
4	720	4	028	4	333	4	637	4	938	4	237
5	726	5	034	5	339	5	643	5	944	5	243
7036	3. 84733	7086	3. 85040	7136	3. 85345	7186	3. 85649	7236	3. 85950	7286	3. 86249
7	739	7	046	7	352	7	655	7	956	7	255
8	745	8	052	8	358	8	661	8	962	8	261
9	751	9	058	9	364	9	667	9	969	9	267
40	757	90	065	40	370	90	673	40	974	90	273
7041	3. 84763	7091	3. 85071	7141	3. 85376	7191	3. 85679	7241	3. 85980	7291	3. 86279
2	770	2	077	2	382	2	685	2	986	2	285
3	776	3	083	3	388	3	691	3	992	3	291
4	782	4	089	4	394	4	697	4	998	4	297
5	788	5	095	5	400	5	703	5	6004	5	303
7046	3. 84794	7096	3. 85101	7146	3. 85406	7196	3. 85709	7246	3. 86010	7296	3. 86308
7	800	7	107	7	412	7	715	7	016	7	314
8	807	8	114	8	418	8	721	8	022	8	320
9	813	9	120	9	425	9	727	9	028	9	326
50	819	7100	126	50	431	7200	733	50	034	7300	332

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10.000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L.
7301	3. 86338	7351	3. 86635	7401	3. 86929	7451	3. 87221	7501	3. 87512	7551	3. 87800
2	344	2	641	2	935	2	227	2	518	2	806
3	350	3	646	3	941	3	233	3	523	3	812
4	356	4	652	4	947	4	239	4	529	4	818
5	362	5	658	5	953	5	245	5	535	5	823
7306	3. 86368	7356	3. 86664	7406	3. 86958	7456	3. 87251	7506	3. 87541	7556	3. 87829
7	374	7	670	7	964	7	256	7	547	7	835
8	380	8	676	8	970	8	262	8	552	8	841
9	386	9	682	9	976	9	268	9	558	9	846
10	392	60	688	10	982	60	274	10	564	60	852
7311	3. 86398	7361	3. 86694	7411	3. 86988	7461	3. 87280	7511	3. 87570	7561	3. 87858
2	404	2	700	2	994	2	286	2	576	2	864
3	410	3	705	3	999	3	291	3	581	3	869
4	416	4	711	4	7005	4	297	4	587	4	875
5	421	5	717	5	011	5	303	5	593	5	881
7316	3. 86427	7366	3. 86723	7416	3. 87017	7466	3. 87309	7516	3. 87599	7566	3. 87887
7	433	7	729	7	023	7	315	7	604	7	892
8	439	8	735	8	029	8	320	8	610	8	898
9	445	9	741	9	035	9	326	9	616	9	904
20	451	70	747	20	040	70	332	20	622	70	910
7321	3. 86457	7371	3. 86753	7421	3. 87046	7471	3. 87338	7521	3. 87628	7571	3. 87915
2	463	2	759	2	052	2	344	2	633	2	921
3	469	3	764	3	058	3	350	3	639	3	927
4	475	4	770	4	064	4	355	4	645	4	933
5	481	5	776	5	070	5	361	5	651	5	938
7326	3. 86487	7376	3. 86782	7426	3. 87075	7476	3. 87367	7526	3. 87656	7576	3. 87944
7	493	7	788	7	081	7	373	7	662	7	950
8	499	8	794	8	087	8	379	8	668	8	955
9	504	9	800	9	093	9	384	9	674	9	961
30	510	80	806	30	099	80	390	30	680	80	967
7331	3. 86516	7381	3. 86812	7431	3. 87105	7481	3. 87396	7531	3. 87685	7581	3. 87973
2	522	2	817	2	111	2	402	2	691	2	978
3	528	3	823	3	116	3	408	3	697	3	984
4	534	4	829	4	122	4	413	4	703	4	990
5	540	5	835	5	128	5	419	5	708	5	996
7336	3. 86546	7386	3. 86841	7436	3. 87134	7486	3. 87425	7536	3. 87714	7586	3. 88001
7	552	7	847	7	140	7	431	7	720	7	007
8	558	8	853	8	146	8	437	8	726	8	013
9	564	9	859	9	151	9	442	9	731	9	018
40	570	90	864	40	157	90	448	40	737	90	024
7341	3. 86576	7391	3. 86870	7441	3. 87163	7491	3. 87454	7541	3. 87743	7591	3. 88030
2	581	2	876	2	169	2	460	2	749	2	036
3	587	3	882	3	175	3	466	3	754	3	041
4	593	4	888	4	181	4	471	4	760	4	047
5	599	5	894	5	186	5	477	5	766	5	053
7346	3. 86605	7396	3. 86900	7446	3. 87192	7496	3. 87483	7546	3. 87772	7596	3. 88059
7	611	7	906	7	198	7	489	7	777	7	064
8	617	8	911	8	204	8	495	8	783	8	070
9	623	9	917	9	210	9	500	9	789	9	076
50	629	7400	923	50	216	7500	506	50	795	7600	081

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10000.

N	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L
7601	3. 88087	7651	3. 88372	7701	3. 88655	7751	3. 88936	7801	3. 89215	7851	3. 89493
2	093	2	378	2	660	2	941	2	221	2	498
3	099	3	383	3	666	3	947	3	226	3	504
4	104	4	389	4	672	4	953	4	232	4	509
5	110	5	395	5	677	5	958	5	237	5	515
7606	3. 88116	7656	3. 88400	7706	3. 88683	7756	3. 88964	7806	3. 89243	7856	3. 89520
7	121	7	406	7	689	7	969	7	248	7	526
8	127	8	412	8	694	8	975	8	254	8	531
9	133	9	417	9	700	9	981	9	260	9	537
10	138	60	423	10	705	60	986	10	265	60	542
7611	3. 88144	7661	3. 88429	7711	3. 88711	7761	3. 88992	7811	3. 89271	7861	3. 89548
2	150	2	434	2	717	2	997	2	276	2	553
3	156	3	440	3	722	3	9003	3	282	3	559
4	161	4	446	4	728	4	009	4	287	4	564
5	167	5	451	5	734	5	014	5	293	5	570
7616	3. 88173	7666	3. 88457	7716	3. 88739	7766	3. 89020	7816	3. 89298	7866	3. 89575
7	178	7	463	7	745	7	025	7	304	7	581
8	184	8	468	8	750	8	031	8	310	8	586
9	190	9	474	9	756	9	037	9	315	9	592
20	196	70	480	20	762	70	042	20	321	70	597
7621	3. 88201	7671	3. 88485	7721	3. 88767	7771	3. 89048	7821	3. 89326	7871	3. 89603
2	207	2	491	2	773	2	053	2	332	2	609
3	213	3	497	3	779	3	059	3	337	3	614
4	218	4	502	4	784	4	064	4	343	4	620
5	224	5	508	5	790	5	070	5	348	5	625
7626	3. 88230	7676	3. 88514	7726	3. 88795	7776	3. 89076	7826	3. 89354	7876	3. 89631
7	235	7	519	7	801	7	08	7	360	7	636
8	241	8	525	8	807	8	087	8	365	8	642
9	247	9	530	9	812	9	092	9	371	9	647
30	252	80	536	30	818	80	098	30	376	80	653
7631	3. 88258	7681	3. 88542	7731	3. 88824	7781	3. 89104	7831	3. 89382	7881	3. 89658
2	264	2	547	2	829	2	109	2	387	2	664
3	270	3	553	3	835	3	115	3	393	3	669
4	275	4	559	4	840	4	120	4	398	4	675
5	281	5	564	5	846	5	126	5	404	5	680
7636	3. 88287	7686	3. 88570	7736	3. 88852	7786	3. 89131	7836	3. 89409	7886	3. 89686
7	292	7	576	7	857	7	137	7	415	7	691
8	298	8	581	8	863	8	143	8	421	8	697
9	304	9	587	9	868	9	148	9	426	9	702
40	309	90	593	40	874	90	154	40	432	90	708
7641	3. 88315	7691	3. 88598	7741	3. 88880	7791	3. 89159	7841	3. 89437	7891	3. 89713
2	321	2	604	2	885	2	165	2	443	2	719
3	326	3	610	3	891	3	170	3	448	3	724
4	332	4	615	4	897	4	176	4	454	4	730
5	338	5	621	5	902	5	182	5	459	5	735
7646	3. 88343	7696	3. 88627	7746	3. 88908	7796	3. 89187	7846	3. 89465	7896	3. 89741
7	349	7	632	7	913	7	193	7	470	7	746
8	355	8	638	8	919	8	198	8	476	8	752
9	360	9	643	9	925	9	20	9	48	9	757
50	366	7700	649	50	930	7800	209	50	487	7900	763

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10,000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L.
7901	3. 89768	7951	3. 90042	8001	3. 90314	8051	3. 90585	8101	3. 90854	8151	3. 91121
2	774	2	048	2	320	2	590	2	859	2	126
3	779	3	053	3	325	3	596	3	865	3	132
4	785	4	059	4	331	4	601	4	870	4	137
5	790	5	064	5	336	5	607	5	875	5	142
7906	3. 89796	7956	3. 90069	8006	3. 90342	8056	3. 90612	8106	3. 90881	8156	3. 91148
7	801	7	075	7	347	7	617	7	886	7	153
8	807	8	080	8	352	8	623	8	891	8	158
9	812	9	086	9	358	9	628	9	897	9	164
10	818	60	091	10	363	60	634	10	902	60	169
7911	3. 89823	7961	3. 90097	8011	3. 90369	8061	3. 90639	8111	3. 90907	8161	3. 91174
2	829	2	102	2	374	2	644	2	913	2	180
3	834	3	108	3	380	3	650	3	918	3	185
4	840	4	113	4	385	4	655	4	924	4	190
5	845	5	119	5	39	5	660	5	929	5	196
7916	3. 89851	7966	3. 90124	8016	3. 90396	8066	3. 90666	8116	3. 90934	8166	3. 91201
7	856	7	129	7	401	7	671	7	940	7	206
8	862	8	135	8	407	8	677	8	945	8	212
9	867	9	140	9	412	9	682	9	950	9	217
20	873	70	146	20	417	70	687	20	956	70	222
7921	3. 89878	7971	3. 90151	8021	3. 90423	8071	3. 90693	8121	3. 90961	8171	3. 91228
2	883	2	157	2	428	2	698	2	966	2	232
3	889	3	162	3	434	3	704	3	972	3	238
4	894	4	168	4	439	4	709	4	977	4	243
5	900	5	173	5	445	5	714	5	982	5	249
7926	3. 89905	7976	3. 90179	8026	3. 90450	8076	3. 90720	8126	3. 90988	8176	3. 91254
7	911	7	184	7	455	7	725	7	993	7	259
8	916	8	189	8	461	8	730	8	998	8	265
9	922	9	195	9	466	9	736	9	1004	9	270
30	927	80	200	30	472	80	741	30	009	80	275
7931	3. 89933	7981	3. 90206	8031	3. 90477	8081	3. 90747	8131	3. 91014	8181	3. 91281
2	938	2	211	2	482	2	752	2	020	2	286
3	944	3	217	3	488	3	757	3	025	3	291
4	949	4	222	4	493	4	763	4	030	4	297
5	955	5	227	5	499	5	768	5	036	5	302
7936	3. 89960	7986	3. 90233	8036	3. 90504	8086	3. 90773	8136	3. 91041	8186	3. 91307
7	966	7	238	7	509	7	779	7	046	7	312
8	971	8	244	8	515	8	784	8	052	8	318
9	977	9	249	9	520	9	789	9	057	9	323
40	982	90	255	40	526	90	795	40	062	90	328
7941	3. 89988	7991	3. 90260	8041	3. 90531	8091	3. 908 0	8141	3. 91068	8191	3. 91334
2	993	2	266	2	536	2	806	2	073	2	339
3	998	3	271	3	542	3	811	3	078	3	344
4	90004	4	276	4	547	4	816	4	084	4	350
5	009	5	282	5	553	5	822	5	089	5	355
7946	3. 90015	7996	3. 90287	8046	3. 90558	8096	3. 90827	8146	3. 91094	8196	3. 91360
7	020	7	293	7	563	7	832	7	100	7	365
8	026	8	298	8	569	8	838	8	105	8	371
9	031	9	304	9	574	9	843	9	110	9	376
50	037	8000	309	50	580	8100	849	50	116	8200	381

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10,000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L.
8201	3. 91387	8251	3. 91651	8301	3. 91913	8351	3. 92174	8401	3. 92433	8451	3. 92691
2	392	2	656	2	918	2	179	2	438	2	696
3	397	3	661	3	924	3	184	3	443	3	701
4	403	4	666	4	929	4	189	4	449	4	706
5	408	5	672	5	934	5	195	5	454	5	711
8206	3. 91413	8256	3. 91677	8306	3. 91939	8356	3. 92200	8406	3. 92459	8456	3. 92717
7	418	7	682	7	944	7	205	7	464	7	722
8	424	8	687	8	950	8	210	8	469	8	727
9	429	9	693	9	955	9	215	9	474	9	732
10	434	60	698	10	960	60	221	10	480	60	737
8211	3. 91440	8261	3. 91703	8311	3. 91965	8361	3. 92226	8411	3. 92485	8461	3. 92742
2	445	2	709	2	971	2	231	2	490	2	747
3	450	3	714	3	976	3	236	3	495	3	752
4	455	4	719	4	981	4	241	4	500	4	758
5	461	5	724	5	986	5	247	5	505	5	763
8216	3. 91466	8266	3. 91730	8316	3. 91991	8366	3. 92252	8416	3. 92511	8466	3. 92768
7	471	7	735	7	997	7	257	7	516	7	773
8	477	8	740	8	2002	8	262	8	521	8	778
9	482	9	745	9	007	9	267	9	526	9	783
20	487	70	751	20	012	70	273	20	531	70	788
8221	3. 91492	8271	3. 91756	8321	3. 92018	8371	3. 92278	8421	3. 92536	8471	3. 92793
2	498	2	761	2	023	2	283	2	542	2	799
3	503	3	766	3	028	3	288	3	547	3	804
4	508	4	772	4	033	4	293	4	552	4	809
5	514	5	777	5	038	5	298	5	557	5	814
8226	3. 91519	8276	3. 91782	8326	3. 92044	8376	3. 92304	8426	3. 92562	8476	3. 92819
7	524	7	787	7	049	7	309	7	567	7	824
8	529	8	793	8	054	8	314	8	572	8	829
9	535	9	798	9	059	9	319	9	578	9	834
30	540	80	803	30	065	80	324	30	583	80	840
8231	3. 91545	8281	3. 91808	8331	3. 92070	8381	3. 92330	8431	3. 92588	8481	3. 92845
2	551	2	814	2	075	2	335	2	593	2	850
3	556	3	819	3	080	3	340	3	598	3	855
4	561	4	824	4	085	4	345	4	603	4	860
5	566	5	829	5	091	5	350	5	609	5	865
8236	3. 91572	8286	3. 91834	8336	3. 92096	8386	3. 92355	8436	3. 92614	8486	3. 92870
7	577	7	840	7	101	7	361	7	619	7	875
8	582	8	845	8	106	8	366	8	624	8	881
9	587	9	850	9	111	9	371	9	629	9	886
40	593	90	855	40	117	90	376	40	634	90	891
8241	3. 91598	8291	3. 91861	8341	3. 92122	8391	3. 92381	8441	3. 92639	8491	3. 92896
2	603	2	866	2	127	2	387	2	645	2	901
3	609	3	871	3	132	3	392	3	650	3	906
4	614	4	876	4	137	4	397	4	655	4	911
5	610	5	882	5	143	5	402	5	660	5	916
8246	3. 91624	8296	3. 91887	8346	3. 92148	8396	3. 92407	8446	3. 92665	8496	3. 92921
7	630	7	892	7	153	7	412	7	670	7	927
8	635	8	897	8	158	8	418	8	675	8	932
9	640	9	903	9	163	9	423	9	681	9	937
50	645	8300	908	50	169	8400	428	50	686	8500	942

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10,000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L.
8501	3. 92947	8551	3. 93201	8601	3. 93455	8651	3. 93707	8701	3. 93957	8751	3. 94206
2	952	2	207	2	460	2	712	2	962	2	211
3	957	3	212	3	465	3	717	3	967	3	216
4	962	4	217	4	470	4	722	4	972	4	221
5	967	5	222	5	475	5	727	5	977	5	226
8506	3. 92973	8556	3. 93227	8606	3. 93480	8656	3. 93732	8706	3. 93982	8756	3. 94231
7	978	7	232	7	485	7	737	7	987	7	236
8	983	8	237	8	490	8	742	8	992	8	240
9	988	9	242	9	495	9	747	9	997	9	245
10	993	60	247	10	500	60	752	10	4002	60	250
8511	3. 92998	8561	3. 93252	8611	3. 93505	8661	3. 93757	8711	3. 94007	8761	3. 94255
2	3003	2	258	2	510	2	762	2	012	2	260
3	008	3	263	3	515	3	767	3	017	3	265
4	013	4	268	4	520	4	772	4	022	4	270
5	018	5	273	5	526	5	777	5	027	5	275
8516	3. 93024	8566	3. 93278	8616	3. 93531	8666	3. 93782	8716	3. 94032	8766	3. 94280
7	029	7	283	7	536	7	787	7	037	7	285
8	034	8	288	8	541	8	792	8	042	8	290
9	039	9	293	9	546	9	797	9	047	9	295
20	044	70	298	20	551	70	802	20	052	70	300
8521	3. 93049	8571	3. 93303	8621	3. 93556	8671	3. 93807	8721	3. 94057	8771	3. 94305
2	054	2	308	2	561	2	812	2	062	2	310
3	059	3	313	3	566	3	817	3	067	3	315
4	064	4	318	4	571	4	822	4	072	4	320
5	069	5	323	5	576	5	827	5	077	5	325
8526	3. 93075	8576	3. 93328	8626	3. 93581	8676	3. 93832	8726	3. 94082	8776	3. 94330
7	080	7	334	7	586	7	837	7	087	7	335
8	085	8	339	8	591	8	842	8	091	8	340
9	090	9	344	9	596	9	847	9	096	9	345
30	095	80	349	30	601	80	852	30	101	80	349
8531	3. 93100	8581	3. 93354	8631	3. 93606	8681	3. 93857	8731	3. 94106	8781	3. 94354
2	105	2	359	2	611	2	862	2	111	2	359
3	110	3	364	3	616	3	867	3	116	3	364
4	115	4	369	4	621	4	872	4	121	4	369
5	120	5	374	5	626	5	877	5	126	5	374
8536	3. 9312	8586	3. 93379	8636	3. 93631	8686	3. 93882	8736	3. 94131	8786	3. 94379
7	131	7	384	7	636	7	887	7	136	7	384
8	136	8	389	8	641	8	892	8	141	8	389
9	141	9	394	9	646	9	89	9	146	9	394
40	146	90	399	40	651	90	902	40	151	90	399
8541	3. 93151	8591	3. 93404	8641	3 93656	8691	3. 93907	8741	3. 94156	8791	3. 94404
2	156	2	409	2	661	2	912	2	161	2	409
3	161	3	414	3	666	3	917	3	166	3	414
4	166	4	420	4	671	4	922	4	171	4	419
5	171	5	425	5	677	5	927	5	176	5	424
8546	3. 93176	8596	3. 93430	8646	3. 93682	8696	3. 93932	8746	3. 94181	8796	3. 94429
7	181	7	435	7	687	7	937	7	186	7	433
8	186	8	440	8	692	8	942	8	191	8	438
9	192	9	445	9	697	9	947	9	196	9	443
50	197	8600	450	50	702	8700	952	50	201	8800	448

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10.000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L
8801	3. 94453	8851	3. 94699	8901	3. 94944	8951	3. 95187	9001	3. 95429	9051	3. 95670
2	458	2	704	2	949	2	192	2	434	2	675
3	463	3	709	3	954	3	197	3	439	3	679
4	468	4	714	4	959	4	202	4	444	4	684
5	473	5	719	5	963	5	207	5	448	5	689
8806	3. 94478	8856	3. 94724	8906	3. 94968	8956	3. 95211	9006	3. 95453	9056	3. 95694
7	483	7	729	7	973	7	216	7	458	7	698
8	488	8	734	8	978	8	221	8	463	8	703
9	493	9	738	9	983	9	226	9	468	9	708
10	498	60	743	10	988	60	231	10	472	60	713
8811	3. 94503	8861	3. 94748	8911	3. 94993	8961	3. 95236	9011	3. 95477	9061	3. 95718
2	507	2	753	2	998	2	240	2	482	2	722
3	512	3	758	3	5002	3	245	3	487	3	727
4	517	4	763	4	007	4	250	4	492	4	732
5	522	5	768	5	012	5	255	5	497	5	737
8816	3. 94527	8866	3. 94773	8916	3. 95017	8966	3. 95260	9016	3. 95501	9066	3. 95742
7	532	7	778	7	022	7	265	7	506	7	746
8	537	8	783	8	027	8	270	8	511	8	751
9	542	9	787	9	032	9	274	9	516	9	756
20	547	70	792	20	036	70	279	20	521	70	761
8821	3. 94552	8871	3. 94797	8921	3. 95041	8971	3. 95284	9021	3. 95525	9071	3. 95766
2	557	2	802	2	046	2	289	2	530	2	770
3	562	3	807	3	051	3	294	3	535	3	775
4	567	4	812	4	056	4	299	4	540	4	780
5	571	5	817	5	061	5	303	5	545	5	785
8826	3. 94576	8876	3. 94822	8926	3. 95066	8976	3. 95308	9026	3. 95550	9076	3. 95789
7	581	7	827	7	071	7	313	7	554	7	794
8	586	8	832	8	075	8	318	8	559	8	799
9	591	9	836	9	080	9	323	9	564	9	804
30	596	80	841	30	085	80	328	30	569	80	809
8831	3. 94601	8881	3. 94846	8931	3. 95090	8981	3. 95332	9031	3. 95574	9081	3. 95813
2	606	2	851	2	095	2	337	2	578	2	818
3	611	3	856	3	100	3	342	3	583	3	823
4	616	4	861	4	105	4	347	4	588	4	828
5	621	5	866	5	109	5	352	5	593	5	832
8836	3. 94626	8886	3. 94871	8936	3. 95114	8986	3. 95357	9036	3. 95598	9086	3. 95837
7	630	7	876	7	119	7	361	7	602	7	842
8	635	8	880	8	124	8	366	8	607	8	847
9	640	9	885	9	129	9	371	9	612	9	852
40	645	90	890	40	134	90	376	40	617	90	856
8841	3. 94650	8891	3. 94895	8941	3. 95139	8991	3. 95381	9041	3. 95622	91	3. 95861
2	655	2	900	2	143	2	386	2	626	2	866
3	660	3	905	3	148	3	390	3	631	3	871
4	665	4	910	4	153	4	395	4	636	4	875
5	670	5	915	5	158	5	400	5	641	5	880
8846	3. 94675	7896	3. 94919	8946	3. 95163	8996	3. 95405	9046	3. 95646	9096	3. 95885
7	680	7	924	7	168	7	410	7	650	7	890
8	685	8	929	8	173	8	415	8	655	8	895
9	689	9	934	9	177	9	419	9	660	9	899
50	694	8900	939	50	182	9000	424	50	665	910	904

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10,000.

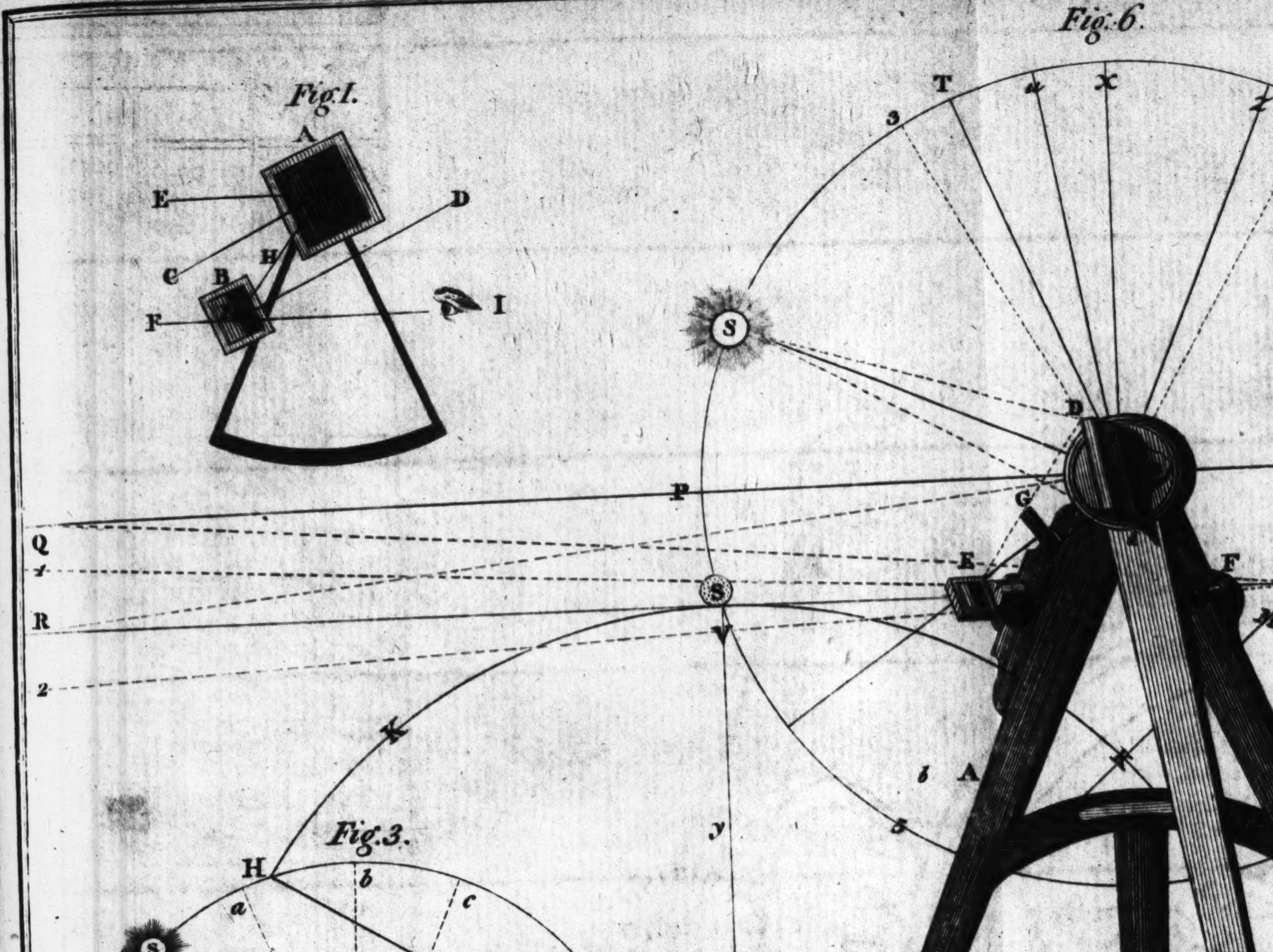
N.	L.	N.	L.	N.	L.	N.	L.	N	L.	N.	L.
9101	3. 95909	9151	3. 96147	9201	3. 96384	9251	3. 96619	9301	3. 96853	9351	3. 97086
2	914	2	152	2	388	2	624	2	858	2	090
3	918	3	156	3	393	3	628	3	862	3	095
4	923	4	161	4	398	4	633	4	867	4	100
5	928	5	166	5	402	5	638	5	872	5	104
9106	3. 95933	9156	3. 96171	9206	3. 96407	9256	3. 96642	9306	3. 96876	9356	3 97109
7	938	7	175	7	412	7	647	7	881	7	114
8	942	8	180	8	417	8	652	8	886	8	118
9	947	9	185	9	421	9	656	9	890	9	123
10	952	60	190	10	426	60	66	10	895	60	128
9111	3. 95957	9161	3. 96194	9211	3. 96430	9261	3. 96666	9311	3. 96900	9361	3. 97132
2	961	2	199	2	435	2	670	2	904	2	137
3	966	3	204	3	440	3	675	3	909	3	142
4	971	4	209	4	445	4	680	4	914	4	146
5	976	5	213	5	450	5	685	5	918	5	151
9116	3. 95980	9166	3. 96218	9216	3. 96454	9266	3. 96689	9316	3 96923	9366	3. 97155
7	985	7	223	7	459	7	694	7	928	7	160
8	990	8	227	8	464	8	699	8	932	8	165
9	995	9	232	9	468	9	703	9	937	9	169
20	999	70	237	20	473	70	708	20	942	70	174
9121	3. 96004	9171	3. 96242	9221	3. 96478	9271	3. 96713	9321	3. 96946	9371	3. 97179
2	009	2	246	2	483	2	717	2	951	2	183
3	014	3	251	3	487	3	722	3	956	3	188
4	019	4	256	4	492	4	727	4	960	4	192
5	023	5	261	5	497	5	731	5	965	5	197
9126	3. 96028	9176	3. 96265	9226	3. 96501	9276	3. 96736	9326	3. 96970	9376	3. 97202
7	033	7	270	7	506	7	741	7	974	7	206
8	038	8	275	8	511	8	745	8	979	8	211
9	042	9	280	9	515	9	750	9	984	9	216
30	047	80	284	30	520	80	755	30	988	80	220
9131	3. 96052	9181	3. 96289	9231	3. 96525	9281	3. 96759	9331	3. 96993	9381	3. 97225
2	057	2	294	2	530	2	764	2	997	2	230
3	061	3	298	3	534	3	769	3	7002	3	234
4	066	4	303	4	539	4	774	4	007	4	239
5	071	5	308	5	544	5	778	5	011	5	243
9136	3. 96076	9186	3. 96313	9236	3. 96548	9286	3. 96783	9336	3. 97016	9386	3. 97248
7	080	7	317	7	553	7	788	7	021	7	253
8	085	8	322	8	558	8	792	8	025	8	257
9	090	9	327	9	563	9	797	9	030	9	262
40	095	90	332	40	567	90	802	40	035	90	267
9141	3. 96099	9191	3. 96336	9241	3. 96572	9291	3. 96806	9341	3. 97039	9391	3. 97271
2	104	2	341	2	577	2	811	2	044	2	276
3	109	3	346	3	581	3	816	3	049	3	280
4	114	4	350	4	586	4	820	4	053	4	285
5	118	5	355	5	591	5	825	5	058	5	290
9146	3. 96123	9196	3. 96360	9246	3. 96595	9296	3 96830	9346	3. 97063	9396	3. 97294
7	128	7	365	7	600	7	834	7	067	7	299
8	133	8	369	8	605	8	830	8	072	8	304
9	137	9	374	9	609	9	844	9	077	9	308
50	142	9200	379	50	614	9300	848	50	081	9400	313

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10,000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L.
9401	3. 97317	9451	3. 97548	9501	3. 97777	9551	3. 98005	9601	3. 98232	9651	3. 98457
2	322	2	552	2	782	2	009	2	236	2	462
3	327	3	557	3	786	3	014	3	241	3	466
4	331	4	562	4	791	4	019	4	245	4	471
5	336	5	566	5	795	5	023	5	250	5	475
9406	3. 97341	9456	3. 97571	9506	2. 97800	9556	3. 98028	9606	3. 98254	9656	3. 98480
7	345	7	575	7	804	7	032	7	259	7	484
8	350	8	580	8	809	8	037	8	263	8	489
9	354	9	585	9	813	9	041	9	268	9	493
10	359	60	589	10	818	60	046	10	272	60	498
9411	3. 97364	9461	3. 97594	9511	3. 97823	9561	3. 98050	9611	3. 98277	9661	3. 98502
2	368	2	598	2	827	2	055	2	281	2	507
3	373	3	603	3	832	3	059	3	286	3	511
4	377	4	607	4	836	4	064	4	290	4	516
5	382	5	612	5	841	5	069	5	295	5	520
9416	3. 97387	9466	3. 97617	9516	3. 97845	9566	3. 98073	9616	3. 98299	9666	3. 98525
7	391	7	621	7	850	7	078	7	304	7	529
8	396	8	626	8	855	8	082	8	308	8	534
9	400	9	630	9	859	9	087	9	313	9	538
20	405	70	635	20	864	70	091	20	318	70	543
9421	3. 97410	9471	3. 97640	9521	3. 97868	9571	3. 98096	9621	3. 98322	9671	3. 98547
2	414	2	644	2	873	2	100	2	327	2	552
3	419	3	649	3	877	3	105	3	331	3	556
4	424	4	653	4	882	4	109	4	336	4	561
5	428	5	658	5	887	5	114	5	340	5	565
9426	3. 97433	9476	3. 97663	9526	3. 97891	9576	3. 98118	9626	3. 98345	9676	3. 98570
7	437	7	667	7	896	7	123	7	349	7	574
8	442	8	672	8	900	8	127	8	354	8	579
9	447	9	676	9	905	9	132	9	358	9	583
30	451	80	681	30	909	80	137	30	363	80	588
9431	3. 97456	9481	3. 97685	9531	3. 97914	9581	3. 98141	9631	3. 98367	9681	3. 98592
2	460	2	690	2	918	2	146	2	372	2	597
3	465	3	695	3	923	3	150	3	376	3	601
4	470	4	699	4	928	4	155	4	381	4	605
5	474	5	704	5	932	5	159	5	385	5	610
9436	3. 97479	9486	3. 97708	9536	3. 97937	9586	3. 98164	9636	3. 98390	9686	3. 98614
7	483	7	713	7	941	7	168	7	394	7	619
8	488	8	717	8	946	8	173	8	399	8	623
9	493	9	722	9	950	9	177	9	403	9	628
40	497	90	727	40	955	90	182	40	408	90	632
9441	3. 97502	9491	3. 97731	9541	3. 97959	9591	3. 98186	9641	3. 98412	9691	3. 98637
2	507	2	736	2	964	2	191	2	417	2	641
3	511	3	740	3	968	3	195	3	421	3	646
4	516	4	745	4	973	4	200	4	426	4	650
5	520	5	750	5	978	5	205	5	430	5	655
9446	3. 97525	9496	3 97754	9546	3. 97982	9596	3. 98209	9646	3. 98435	9696	3. 98659
7	529	7	759	7	987	7	214	7	439	7	664
8	534	8	763	8	991	8	218	8	444	8	668
9	539	9	768	9	996	9	223	9	448	9	673
50	543	500	772	50	8000	9600	227	50	45	700	677

A TABLE of COMMON LOGARITHMS, FROM 1, TO 10,000.

N.	L.	N.	L.	N.	L.	N.	L.	N.	L.	N.	L.
9701	5. 98682	9751	3. 98905	9801	3. 99127	9851	3. 99348	9901	3. 99568	9951	3. 99787
2	686	2	909	2	131	2	352	2	572	2	791
3	691	3	914	3	136	3	357	3	577	3	795
4	695	4	918	4	140	4	361	4	581	4	800
5	700	5	922	5	145	5	366	5	585	5	804
9706	3. 98704	9756	3. 98927	9806	3. 99149	9856	3. 99370	9906	3. 99590	9956	3. 99808
7	709	7	932	7	154	7	374	7	594	7	81
8	713	8	936	8	158	8	379	8	599	8	817
9	717	9	941	9	162	9	383	9	603	9	82
10	722	60	945	10	167	60	388	10	607	60	82
9711	3. 98726	9761	3. 98949	9811	3. 99171	9861	3. 99392	9911	3. 99612	9961	3. 9983
2	731	2	954	2	176	2	397	2	616	2	83
3	735	3	958	3	180	3	401	3	621	3	83
4	740	4	963	4	185	4	405	4	625	4	84
5	744	5	967	5	189	5	410	5	629	5	84
9716	3. 98749	9766	3. 98972	9816	3. 99193	9866	3. 99414	9916	3. 99634	9966	3. 9985
7	753	7	976	7	198	7	419	7	638	7	85
8	758	8	981	8	202	8	423	8	642	8	86
9	762	9	985	9	207	9	427	9	647	9	86
20	767	70	989	20	211	70	432	20	651	70	87
9721	3. 98771	9771	3. 98994	9821	3. 99216	9871	3. 99436	9921	3. 99656	9971	3. 9987
2	776	2	998	2	220	2	441	2	660	2	87
3	780	3	9003	3	224	3	445	3	664	3	88
4	784	4	007	4	229	4	449	4	669	4	88
5	789	5	012	5	233	5	454	5	673	5	89
9726	3. 98793	9776	3. 99016	9826	3. 99238	9876	3. 99458	9926	3. 99677	9976	3. 9989
7	798	7	021	7	242	7	463	7	682	7	90
8	802	8	025	8	247	8	467	8	686	8	90
9	807	9	029	9	251	9	471	9	691	9	90
30	811	80	034	30	255	80	476	30	695	80	91
9731	3. 98816	9781	3. 99038	9831	3. 99260	9881	3. 99480	9931	3. 99699	9981	3. 9991
2	820	2	043	2	264	2	484	2	704	2	92
3	825	3	047	3	269	3	489	3	708	3	92
4	829	4	052	4	273	4	493	4	712	4	93
5	834	5	056	5	277	5	498	5	717	5	93
9736	3. 98838	9786	3. 99061	9836	3. 99282	9886	3. 99502	9936	3. 99721	9986	3. 9993
7	843	7	065	7	286	7	506	7	726	7	94
8	847	8	069	8	291	8	511	8	730	8	94
9	851	9	074	9	295	9	515	9	734	9	95
40	856	90	078	40	300	90	520	40	739	90	95
9741	3. 98860	9791	3. 99083	9841	3. 99304	9891	3. 99524	9941	3. 99743	9991	3. 9996
2	865	2	087	2	308	2	528	2	747	2	96
3	869	3	092	3	313	3	533	3	752	3	97
4	874	4	096	4	317	4	537	4	756	4	97
5	878	5	100	5	322	5	542	5	760	5	97
9746	3. 98883	9796	3. 99105	9846	3. 99326	9896	3. 99546	9946	3. 99765	9996	3. 9998
7	887	7	109	7	330	7	550	7	769	7	98
8	892	8	114	8	335	8	555	8	774	8	99
9	896	9	118	9	339	9	559	9	778	9	99
50	900	9800	123	50	344	9900	564	9950	782	1000	4000



N.D. Falck. M.D. Delin.

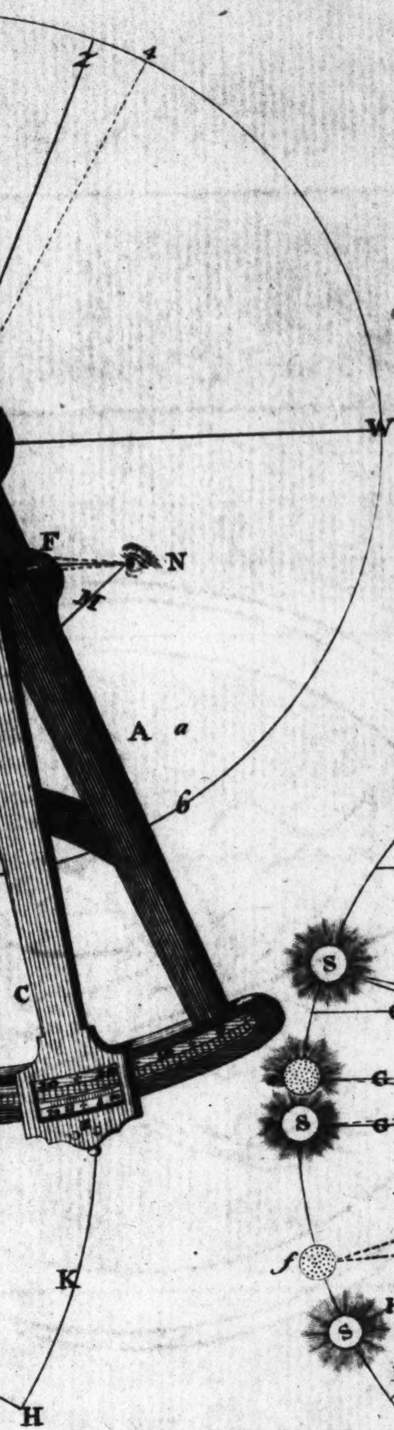


Fig. 2.

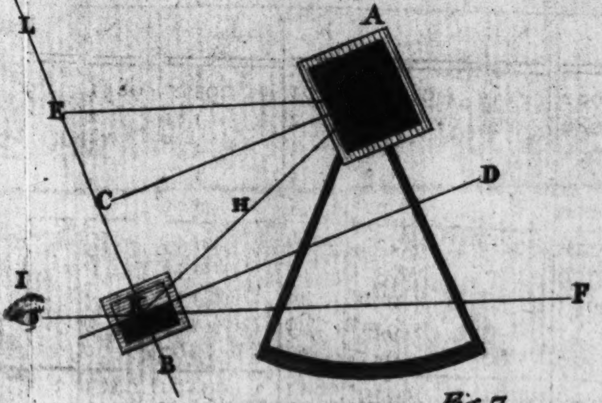


Fig. 7.

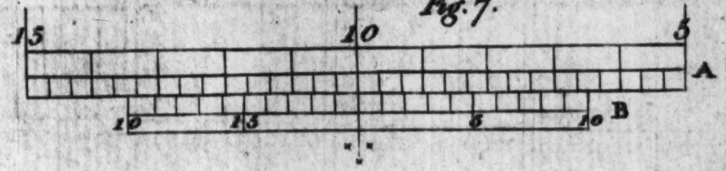
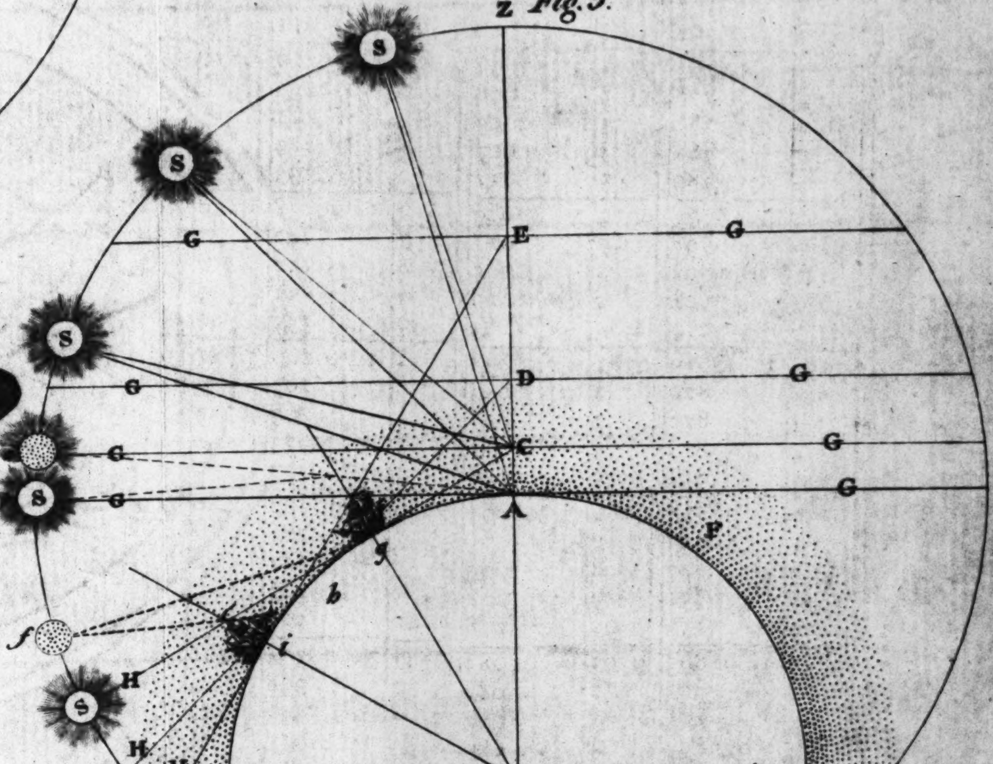


Fig. 5.



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APPENDIX
TO THE
READY OBSERVATOR;
CONTAINING
A DESCRIPTION and DEMONSTRATION
OF THE
PRINCIPLES of HADLEY's QUADRANT,
With its Application to the taking a correct Altitude at SEA.

BY N. D. FALCK, M. D.

Illuſtrated with a Copper-plate.

Hiſtory of the Inſtrument.

THE Invention of this moſt noble Inſtrument is aſcribed to John Hadley, Eſq; a Gentleman of known Abilities in the Sciences, particularly in Optics; who firſt laid the Inſtrument, together with a Deſcription thereof, before the Royal Society, in May 1731, as appears in the Philoſophical Tranſactions, N°. 420.

But in the Year 1742, after the Death of Dr. Halley, there was found amongſt his Papers, a Drawing of a Sea Octant, for taking the Sun's Altitude at Sea by Reflection, together with a Deſcription thereof in the Hand-writing of the great Sir Iſaac Newton, as appears in the Philoſophical Tranſactions, N°. 465. Whence it ſhould ſeem, that each of theſe two Gentlemen might lay equal Claim to the Invention of that Inſtrument. Be this as it may, Mr. Hadley only made it public, wherefore the Quadrant has ever born his Name, in Honour of him as the original Inventor.

Mr. Hadley took great Pains to bring his Quadrant into general Uſe; many Obſervations were taken on Board the Chatham Yacht and other Ships in the Navy; and its ſuperior Excellencies over every other Inſtrument for that Uſe, were teſtified by Gentlemen of unqueſtionable Abilities in the maritime Sciences.

Notwith-

Notwithſtanding all this, the Quadrant lay neglected for almoſt 20 Years: Seamen would not be prevailed on to lay aſide their old accuſtomed Inſtruments, and adopt one evidently ſuperior, not only with Reſpect to the Conveniency of the Obſerver, but in the Correctneſs of the Altitude taken. This is one Proof, amongſt many, of the Force of Cuſtom and Prejudice, and the Difficulties of bringing a new Invention into Uſe, although the Advantages are conſpicuous at firſt View.

At length, however, it's Merit got the better of Prejudice; and Seamen are now ſo well convinced of its ſuperior Excellencies, that it is univerſally doubted, whether Poſterity will ever produce another ſuperior in Utility.

As the Uſe of Hadley's Quadrant now is become almoſt univerſal, many Attempts have been made by the ingenious to improve it, either with artificial Horizons, or by various new Methods of adjuſting it; few however have anſwered the Expectation in Practice. Many are alſo the Deſcriptions of that Inſtrument, inſomuch that my giving one here, might ſeem wholly unneceſſary; but having not found any, even the moſt ingenious that has given me ſufficient Satisfaction in explaining its Principles, particularly thoſe on which a correct Altitude depends, I am therefore induced to offer the following Deſcription; and to endeavour to make it ſo plain, as to render it eaſily underſtood by the practical Seaman; with an Intent to render the ready Obſervator the more complete.

It is not uncommon for different Obſervers to vary in their Altitudes taken at the ſame Time, and in the ſame Ship; and ſome ſhall complain of their Quadrant being either northerly or ſoutherly, (as it is termed) or it ſhall ſeem ſome how erroneous, although perhaps the Inſtrument is the beſt that can be procured; whence ſome are induced to take peculiar Methods of adjuſting the Inſtrument, which often makes it worſe, and renders the moſt accurate Quadrant fallacious. To remedy this Evil, it is neceſſary to underſtand the Quadrant in all its Parts; and it will clearly appear, that there is but one Way of adjuſting it, namely, by the Marine or viſible Horizon, and that immediately before the Altitude is taken; and every other Method however curious in Theory, muſt nevertheleſs be more or leſs erroneous, when reduced to Practice.

Hadley's Quadrant has two Qualities, which every experienced Seaman is well convinced of, but very few indeed can account for. The firſt, the farther diſtant the Horizon is, the more accurate is the adjuſting. The ſecond, that the Inſtrument

ſtrument being moved to and fro, as is unavoidable in a rough Sea, ſtill it ſhall not affect the Altitude, provided the Inſtrument is held vertically, and not moved ſideways. Theſe Qualities, with all the reſt, I ſhall here endeavour to account for; and as a plain Quadrant with only the Apparatus for a fore Obſervation, is in my Opinion the moſt uſeful in Practice at Sea, I ſhall confine myſelf principally to that only, and treat of no other Operation, than taking a correct Altitude.

Deſcription of Hadley's Quadrant.

THE Inſtrument is in Reality but the eighth Part of a Circle, containing an Angle of 45° wherefore it is ſometimes called an Octant; but the Scale on the Arch, being divided into equal Parts, (anſwering in Practice equal to Degrees) it is on that Account oftener ſtiled a Quadrant. Both therefore may be proper, though I ſhould imagine Quadrant is the moſt convenient term, as it anſwers that Purpoſe in Practice.

The Parts are the following: —See Figure 6.

A A, The two Sides of the Quadrant.

A a, The Vane Side, which is held neareſt the Body in the fore Obſervation.

A b, The Horizon Side, held off from the Body.—But in the back Obſervation theſe Sides are held contrary.

B, The Arch or Limb of the Quadrant, on which is the Scale, being divided into 90 Degrees.

C, The Index of the Quadrant, extended from the Centre over the Arch, ſo as to be capable of being moved along all the Degrees on the Scale.

D, The Index Mirror, or great Speculum, fixed on the Index at the Centre, and perpendicular to the Plane of the Inſtrument, in the ſame Direction with the principal Line of the Nonius.

E, The Horizon Glaſs, or little Speculum, for the fore Obſervation: This Glaſs muſt alſo be placed perpendicular to the Plane of the Inſtrument, and parallel to the great Speculum, when the Index is at the Beginning of the Scale: On the Accuracy of this depends the adjuſting of the Quadrant. The Horizon Glaſs has one half tranſparent, through which the Horizon is ſeen, and the other half is ſilvered for the Reflexion of the Horizon from the great Mirror, in adjuſting the Inſtrument.

F, The Sight Vane, for the fore Obſervation, which muſt be accurately placed oppoſite the Horizon Glaſs, and at an equal Diſtance from the Centre of the Quadrant, but the Accuracy of this is ſeldom paid Attention to, and is not of much Conſequence.*

G, The two dark Glaſſes or Screens, occaſionally let down, in order to darken the Image of the Sun when it ſhines too bright. Theſe Glaſſes ſhould be placed parallel to the Horizon Glaſs, though the Accuracy of this Situation is not of very great Conſequence.

Z, The Nonius, or rather Vernier on the Index: This is a Kind of Diviſion intended to point out, with the greateſt Accuracy, the Degrees and Minutes of the Sun's Altitude on the Scale of the Arch of the Quadrant; being much ſuperior to the Dioganal Lines conſtructed for the ſame Purpoſe, heretofore made uſe of.

Mr. Pierre Vernier, a Frenchman, was the firſt Contriver of this Kind of Diviſion as far back as 1631; after him Petrus Nonius claimed alſo the Invention, and brought it more into general Practice. This Kind of Scale is called therefore either Vernier or Nonius, indifferently.

The Contrivance is thus:—See Fig. 7.

Let A be Part of the Scale of Degrees on the Arch of the Quadrant, each Degree being divided into three equal Parts, each Diviſion equal to 20 Minutes.

B, The Vernier or Nonius, fixed to the Index of the Inſtrument, being the Extent of ſeven Degrees, or 21 of the above Diviſion, but here divided into 20 equal Parts, wherefore each of the Diviſion of the Nonius muſt exceed the Diviſion of the Scale by one Minute, for

7 Degrees on the Scale = 21 Parts or Diviſions.
7 Ditto on the Nonius = 20 Ditto.
Now 7 Degrees = 420 Minutes.
And 420 divided by 21 = 20.
420 divided by 20 = 21.

Therefore 1 Minute, or $\frac{1}{60}$ is the Difference.

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* In moſt Inſtruments we find the Sight Vane a little higher than the Horizon Glaſs. I have never met with any ſatisfactory Reaſon given for it. It is generally imagined to ariſe from making an Allowance for Refraction of the great Speculum. But in my Opinion it is an Error of the Inſtrument followed from blind Prejudice and Cuſtom; and though it is not of much Conſequence, I will be greatly obliged to any one, that ſhall pleaſe to convince me to the contrary.

The Uſe of this Invention depends upon the Correſpondence of the Lines on the Nonius affixed to the Index, correſponding with the Lines of the Scale on the Arch.

In Fig. 7 before us, we ſee the principal Line of the Nonius correſponds exactly with 10 Degres on the Scale; and we ſee no other Lines do, therefore 10 Degrees is here underſtood the exact Angle.

Now as the Nonius is numbered to the *Right* 5, 10, and to the *Left* from the principal Line 15, 10, it muſt follow, as the Scale on the Arch is numbered from the *Right* to the *Left*, and the principal Line on the Nonius pointing out either a Deficiency or Overplus of Minutes, as it ſtands either to the *Right* or *Left*, ſuch muſt be read of on the Nonius, on the contrary Side to what the principal Line on the Nonius points out on the Scale of the Arch. For Example; ſuppoſe the Index be but very little moved to the *Left* on the Scale, the firſt Diviſion to the *Right* on the Nonius would naturally correſpond with the laſt Diviſion next to 10 Degrees to the *Right*, on the Scale of the Arch, and would point out 10 Degrees and 1 Minute; and ſo on, to 5, or to 10, when then the principal Line on the Nonius would come betwixt the two firſt Diviſions on the Scale to the *Left*, and thus the Index would point out 10 Degrees 10 Minutes.

On the contrary, if the Index ſhould be placed to the *Right* of 10 Degrees, ſuppoſe equal Diſtance as mentioned before, the *Left* Diviſion next to the principal Line on the Nonius, to correſpond with the *Left* Diviſion next to 10 Degrees on the Scale, it would naturally read 9 Degrees, 59 Minutes; if farther that the Line 15, came in Conjunction, it would read 9 Degrees 55 Minutes; or if to 10, to ſigniſy 9 Degrees 50 Minutes, and ſo with the reſt. This with about 10 Minutes Practice, will eaſily be acquired by the Obſerver with the Accuracy ſufficient for aſcertaining the true Altitude.

Thus much for the various Parts of a plain Hadley's Quadrant, without the Apparatus for a back Obſervation; which though it may have its Uſes ſometimes, yet the Neceſſity occurs ſo ſeldom, that for my own Part I ſhould rather for actual Service have my Inſtrument without its Incumbrances.

The great Speculum ſhould be ground very true, both Surfaces of an exact Plane, and the Whole of an even Thickneſs; the internal Edge correſponding with the Centre of the Quadrant, and ſo ſtrongly fixed perpendicular to the Index, as not to make it liable to Accident. And when thus ſent out of the Hands of a Mathematical Inſtrument-Maker, although it is provided with adjuſting Screws, this Glaſs ſhould not at all Events be meddled with, unleſs on Account of injurious Accidents; for on the Accuracy of that Speculum being truly fixed, depends the Accuracy of the Altitude obtained.

On the Backſide of the Quadrant are Screws for the adjuſting of the Horizon Glaſs. This Apparatus is what the Obſerver ought to accuſtom himſelf to, and make good Uſe of in adjuſting his Inſtrument: But although Screws are provided in Front, they ſhould not be touched, as they are calculated only to adjuſt the Glaſs perpendicular to the Inſtrument, which is the Buſineſs of the Inſtrument-Maker, before the Quadrant is ſent to Sea.

For actual Service at Sea, I would adviſe a plain Hadley's Quadrant, made of good old ſeaſoned Mahogany, or Ebony, with a ſtrong Braſs Index, an Ivory Scale on the Arch, accurately divided, and a Vernier or Nonius affixed to the Index, the great Speculum and Horizon Glaſs ſtrongly mounted, and the Quadrant of twelve Inches Radius. But thoſe who would have the Apparatus for a back Obſervation added, the Inſtrument muſt have at leaſt 15, or rather 18 Inches Radius, otherwiſe the Head of the Obſerver muſt be in his own Light.

Demonſtration of the Principles of Hadley's Quadrant.

THE Operation of that noble Inſtrument depends upon this ſimple, but great Law in Optics; namely, *That the Angle of Incidence, is equal to the Angle of Reflexion.*

Fore Obſervation. See Fig. 1.

Let A be the great Speculum, }
B the Horizon Glaſs, } parallel to each other.

Draw C G the perpendicular, to the Plane of the great Speculum, and D K the perpendicular, to the Plane of the Horizon Glaſs. Then let E G be the Horizon received by the Ray of Incidence in the great Speculum; and F K the Horizon ſeen through the Horizon Glaſs by the Obſerver I.

Now as the great Speculum and Horizon Glaſs are parallel, it muſt follow their Perpendiculars C G and D K muſt alſo be parallel; that is, the Ray of Incidence EG, and the Ray of Reflexion H G muſt be equal angular from the Perpendicular C G; or which is the ſame, the Angle of Incidence E G C, muſt be equal to the Angle of Reflexion C G K.

Again, the Ray of Reflexion from the great Speculum H K becoming a Ray of Incidence in the Horizon Glaſs, it muſt reflect equal angular from the perpendicular K D, as K I; whence it comes, that the Horizon being received by by the great Speculum, and ſent back again by Reflexion into the ſilvered Part of the Horizon Glaſs, muſt be ſeen by the Obſerver to correſpond in one Line with the Horizon F K, ſeen in direct Viſion by the Obſerver I; and on this depends the Adjuſtment of the Quadrant in the fore Obſervation.

The ſame Theory holds good in the back Obſervation.

Back Obſervation. See Figure 2.

Let A be the great Speculum as before.

B The Horizon Glaſs placed at right Angles with the great Speculum, or with the Horizon Glaſs of the fore Obſervation.

E G The Horizontal Ray of Incidence in the great Speculum.

F K The Horizon ſeen by the Obſerver I, oppoſite to the Horizon E G.

But as the Horizon Glaſs B in the back Obſervation is at right Angles with the great Speculum, the perpendicular L K muſt alſo be at right Angles with the perpendicular C G, or the perpendicular of the Horizon Glaſs of the fore Obſervation D K; therefore it muſt follow, the Adjuſtment muſt be inverted to the former, and the Horizon E G, muſt be ſeen to correſpond with the Horizon F K in the oppoſite Hemiſphere; and on this depends the Adjuſtment of the back Obſervation.

This being underſtood, let us proceed to the Sun's Altitude obtained on the ſame Principles.

See Figure 3.

Let A A A be the great Speculum in all its Poſitions from c to a, ſuppoſing the Index being moved over the whole Scale of Degrees from e to d.

K K The Horizon Glaſs for the fore Obſervation.

N N The Horizon Glaſs for the back Obſervation.

F R The Horizontal Ray of Incidence in the great Speculum.

M L The Horizon ſeen through the Horizon Glaſs, both of the fore and back Obſervations, which Horizons are ſuppoſed to correſpond exactly in one Line in adjuſting the Quadrant, the Index being at A d. Now according to the before mentioned Law, *the Angle of Incidence* being equal to the *Angle of Reflection*; and the Horizon F R and M L being joined into one, and made the fixed Point to govern the Sun's Altitude by; it muſt follow, that while the Index moves from d to e on the Quadrant, making 45 Degrees of a Circle, the great Speculum will receive all Objects in the Heavens from F to b containing an Arch of 90 Degrees. Thus, ſuppoſe the Index and great Speculum are at A a d, the Horizon F is the Object of Incidence and Reflexion. If the Index and Speculum be at c A e and the Sun ſhould be at b, it would then be received by the great Speculum by the incidental Ray, and the Sun's Image would be ſent back again by the Ray of Reflexion to the Horizon at F. But if the Index and great Speculum ſhould be at b A f, the Sun S would be ſent by the incidental Ray into the great Speculum, and reflected back again in the Horizon Glaſs by the Ray of Reflexion O; and the Obſerver would behold the Image of the Sun correſpond with the Horizon F as before; for the Angle S P F of Incidence would be equal to the Angle of Reflexion F P O, and thus the Index would point out that the Sun would be 45 Degrees above the Horizon, the Altitude required.

The Difference between the fore and the back Obſervation in all theſe Caſes is this: That in the fore Obſervation the Obſerver L views the Horizon M through the Horizon Glaſs K K, in direct Viſion made to correſpond with F, where he brings down the Sun's Image; whilſt in the back Obſervation the Obſerver M having made the Horizon F behind him, join with the Horizon L before him, in adjuſting through the Horizon Glaſs N N; he muſt therefore bring the Sun's Image in a contrary Direction to correſpond with the Horizon before him; becauſe theſe two Horizon Glaſſes being placed at right Angles to each other, therefore the Objects of Reflexion muſt naturally be inverted.

But there is a Peculiarity of Hadley's Quadrant, which I have found no where explained, and is of the utmoſt Conſequence to be well underſtood, in accurately adjuſting that Inſtrument; and for the Want of knowing that Particular, various errroneous Methods of adjuſting have been adopted, the Conſequences of which have been, the taking of falſe Altitudes.

The Peculiarity I ſpeak of is this: The great Speculum and the Horizon Glaſs for the fore Obſervation muſt be parallel, when the Index is at the beginning of the Scale, as before obſerved, whereon the Theory already delivered depends. But from the Nature of the Inſtrument, the Horizon Glaſs muſt be ſituated underneath the great Speculum; wherefore the Horizon incited into the great Speculum, and the Horizon ſeen by direct Viſion, muſt differ from each other parallel, as the Diſtance of the Glaſſes; as for Example. In the Figure before us, F R parallel to M L, muſt differ as the Centre of the Horizon Glaſs K K is below the Centre of the great Speculum in the Situation a A d. Now admit as in the Figure, M and F are near Objects by which the Quadrant is adjuſted; if then theſe Objects are made to coincide in adjuſting, the Inſtrument muſt be erroneous equal to an Angle of P F Q or P M Q; but if the Object is remote, ſuppoſe ſome Miles as a diſtant Horizon, thoſe Angles muſt naturally vaniſh into nothing, and the Inſtrument will be correct. Hence it is at once evident that no near Object will anſwer for adjuſting, but the farther the Horizon is, the better will be the adjuſting; and this Remark here demonſtrated, I recommend to every Seaman's Attention, to prevent his being miſled in that Particular, from taking a correct Altitude, as will be hereafter farther explained.

Having thus laid down the Principles of this noble Inſtrument, let us next conſider the natural Occurrences attending an Obſervation at Sea, common to all Inſtruments in general; and then we will view Hadley's Quadrant as if reduced to Practice.

Of Refraction.

IT is an eſtabliſhed Law in Optics, that a Ray is refracted in Proportion to the Denſity of the Medium through which is paſſes.

See Fig. 4.

Let a Piece of Money, or any other Object be put at the Bottom of a Baſon filled with Water, and let an Eye A be placed ſo as barely to obſerve it; now if the Baſon is emptied, the Object will diſappear, and apparently be depreſſed from B to C; and as the Baſon is again filled with Water, the Object again will be elevated, and ſeen by the Obſerver as before.

This ſimple Experiment explains the Phœnomenon of Refraction, and why we ſhall frequently obſerve the Image of the Sun or Moon above, whilſt the Bodies are yet beneath the Horizon; becauſe the Atmoſphere is denſeſt towards the Surface of the Globe: But as the Sun, or any other Heavenly Object aſcends, and the Rays approach more towards a perpendicular Direction, the Refraction muſt conſequently leſſen.

See Figure 5.

Thus an Obſerver at A, C, or D, will behold the Image of the Sun at f or a, beyond the true Place, as it is viewed through a great Portion of the denſe Atmoſphere; but as the Sun riſes, ſuppoſe as at c, d and e, the Rays becoming more towards a perpendicular Direction, the Refraction vaniſh, and the Obſervation comes nearer to the Truth. On theſe Principles, the annexed Table of Refraction is founded, calculated in particular for this Work; agreeing very near with Mr. Flamſted's.

It

It is farther to be obſerved, that as the Atmoſphere will differ in Quality, (even conſiderably at Times in a Quarter of an Hour) particularly in hazy Weather; conſequently the Refraction alſo will differ, not only with reſpect to the Sun, but in regard to the Horizon itſelf. It is expedient therefore to adjuſt the Inſtrument before every Obſervation, in order to aſcertain a correct Altitude.

Of the Dip of the viſible Horizon.

See Fig. 5.

LET A A A repreſent the Surface of the Globe of the World, whoſe Semi-diameter A B is computed equal to 43,946,552 Engliſh Feet. Let B Z be the Zenith Line, on which let A, C, D, E, be the different Elevations from the Surface of the Sea; the imaginary Lines then, perpendicular to the Zenith Line from the different Elevations, as G A G, G C G, G D G, and G E G, are to be underſtood as the reſpective true Horizons. But the Lines or Tangents C g H, D h H, and E i H, are the viſible or marine Horizons touching the Surface of the remote Sea. The Dip therefore is to be conceived the various Angles G C H, G D H, and G E H; and the Diſtance of ſuch marine Horizons as C g, D h, and E i, is computed by a Problem in plane Trigonometry; namely the Sides B C, B D, B E, and the Sides B g, B h, B i, being given, to find the Sides C g, D h, E i, the Diſtance of the viſible Horizons required; on which the annexed Table of the horizontal Diſtance is founded.

This being underſtood, it is evident, that ſuppoſe an Eye being placed at A, cloſe to the Surface of the Water, the marine Horizon and true Horizon muſt be the ſame; but the Obſerver being elevated at C, will ſee the Ship g, though not the Object i, it being depreſſed below his Horizon; whilſt if elevated at E, he will both ſee g and i, though at A he can ſee neither. Now as the Image of the Sun is brought down to touch the Edge of the viſible Horizon, it muſt follow, that as the Obſerver is elevated from the Surface of the Sea, the Horizon muſt be diſtanced accordingly; wherefore that Diſtance muſt be ſubtracted from the apparent Altitude.

Of the Sun's Semi-diameter.

WITH other Inſtruments the Obſerver muſt be content with taking his Altitude from the Sun's Centre as near as he can gueſs; but Hadley's Quadrant has in that reſpect this ſingular Advantage, that the Obſerver may bring down the Sun's Image in a true circular Form, even though the Sun ſhould be conſiderably obſcured

obſcured by the Clouds, ſo as hardly to be diſcernable with the naked Eye; or if the Sun is ſo bright as to make the Obſervation troubleſome or dazzling to the Eye, with other Inſtruments, this is provided with dark Glaſſes or Screens, by which the Sun's Image may be rendered diſtinct alſo. Now as the Sun's Semidiameter meaſures upon the Quadrant 32 Minutes, (that is, by meaſuring the upper to the lower Arch of the Image of the Sun by the horizontal Line) and as the taking of the Centre would be uncertain, it is therefore with the greateſt Propriety adopted, as the univerſal Practice, to make the lower Arch or Limb of the Sun's Image touch the Horizon with great Exactneſs; and thus it becomes neceſſary in the Calculation to ſubtract 16 Minutes for the Sun's Semi-diameter, to make the Altitude anſwer, as if it had been taken from the Centre.

Having made theſe neceſſary Remarks, we will view this moſt noble Inſtrument as if actually in the Operation of taking an Altitude.

Theory of Obſerving.

See Figure 6.

Let A A B E D, &c. repreſent Hadley's Quadrant. K K K be the Surface of the Sea. I H, I K, I V, the Semidiameters of the Earth. L K M, the Zenith Line. K M the Elevation from the Surface of the Sea of the Obſerver N.

Let P T W be the Solar Arch, Q P the Horizon by Incidence in the great Speculum made to coincide with the Horizon R N ſeen through the Horizon Glaſs E, in adjuſting the Quadrant, ſuppoſing the Angle Q N R, or R G Q to be vaniſhed, and both Horizons joined into one Line, terminating at V touching the Surface of the Sea, K K K. Then according to the foregoing Theory, the incidental Ray of the Sun will be received by the great Speculum, from thence reflected back again into the Horizon Glaſs, and the Obſerver will ſee the Sun's Images at V, touching the Horizontal Line with the lower Limb, which to the Centre of the ſame Image is 16 Minutes, and therefore is to be ſubtracted from the Altitude. And as the Sun is always refracted beyond its true Altitude, the Refraction, according to the foregoing Doctrine and the annexed Table, muſt be ſubtracted alſo.

Again, if the Obſerver N, is elevated from the Surface of the Sea at K M, the Diſtance of the viſible Horizon N S in Proportion, muſt alſo be ſubtracted from the apparent Altitude.

Here we muſt not omit taking Notice of one great Excellency of Hadley's Quadrant, beyond all other Inſtruments for that Uſe; namely, that notwithſtanding the Obſerver is agitated by the Roughneſs of the Sea, during his obſerving, he ſtill may keep the Image of the Sun and the horizontal Line in cloſe Contact. But to do this with any other Inſtrument, requires ſuch a remarkable Steadineſs, as even by the moſt experienced to be impracticable in a rough Sea.

This great Quality is explained thus: Since the great Speculum and the Horizon Glaſs are kept in the ſame Inclination with each other, when once the Obſerver has brought the Sun's Image down to the Horizon, and the Obſerver viewing through the Horizon Glaſs E, will make an Angle above and below the viſible Horizon, equal to 1 N 2; therefore it will admit the Quadrant to be moved to and fro ſuppoſe from 5 to 6, equal as the Lines of Direction in the Heavens T a x z may be varied to 3 and 4 in the ſame Arch. Now as the incidental Ray of the Sun may fall on any Part of the great Speculum from D to d, from thence reflected back again on any Part of the Horizon Glaſs; therefore, whilſt the Obſerver keeps his viſible Horizon in view within the aforeſaid Angle ſeen through the Horizon Glaſs, the Image of the Sun will always keep ſtationary as at firſt. This Liberty of the Obſerver in moving his Inſtrument to and fro, (ſtill having his Objects, the Sun's Image and the Horizon in one Point of View) not only facilitates the Obſervation, but adds much to the Accuracy of the Altitude, and renders therefore at all Times an Obſervation taken with Hadley's Quadrant more correct than if taken with any Inſtrument whatever, hitherto known.

Having now finiſhed our Theory, we will proceed to the practical Part.

Of Adjuſting Hadley's Quadrant.

THERE is hardly a Seaman, but has heard of various Methods of adjuſting his Hadley's Quadrant; and ſome too have been induced to adopt Methods very curious in Theory, but very fallacious in Practice. From what has been ſaid before, it is plain, that adjuſting the Inſtrument by near Objects muſt be erroneous, let the Mode of doing it be what it may. There is but one true Method, and that is by the viſible marine Horizon, and the farther that is diſtant the better.

To adjuſt the Quadrant therefore by this ſimple and true Method, I would previouſly obſerve, that he ſhould be careful to take a well made Inſtrument with him to Sea; the great Speculum ground of a true Plane, even Thickneſs, ſquarely fixed, and ſtrongly mounted; the ſilvered Part anſwering exactly with the Centre

of

of the Inſtrument and with the Nonius of the Index. In this Condition the Obſerver has no Buſineſs with the great Speculum, than barely preſerving it from Accidents; for all the Adjuſtments of that Glaſs is the Buſineſs of a Mathematical Inſtrument-maker. The Horizon Glaſs ſhould be well mounted, and fixed ſquare to the Inſtrument alſo; and although it is provided with adjuſting Screws in Front, the Obſerver ſhould be equally careful not to meddle with that Part any more than the former. But on the back Side of the Quadrant are the Apparatus for adjuſting the Horizon Glaſs, and this is the Part the Obſerver ought to know how to make proper Uſe of, which by the following Method he will find as plain as it is eaſy.

Let your Index be at the beginning of the Scale, ſo that the principal Line of the Vernier or Nonius correſponds with 0 on the Scale of the Arch, with the greateſt Exactneſs poſſible: There fix your Index, with the Screw on the back Part provided for that Purpoſe.

Then view with one Eye (the other being ſhut) through one of the Holes in the Vane, and through the tranſparent Part of the Horizon Glaſs to the Horizon below the Sun; and adjuſt your Horizon Glaſs, ſo that the Horizon you ſee by direct Viſion through the tranſparent Part of the Glaſs, and the Horizon received in the great Speculum, and reflected back again, ſeen in the ſilvered Part of the Horizon Glaſs, correſpond in one exact Line. During this Adjuſtment, you will be careful to hold your Inſtrument virtically, and turn yourſelf a little from Side to Side, obſerving that the Horizon by Reflexion and direct Viſion correſpond with great Exactneſs.

I have before obſerved, that all Kinds of Adjuſtments by near Objects muſt be erroneous. But there is a Method lately introduced into Practice, which though it has every Appearance of Exactneſs in its Favour, nevertheleſs for taking the Sun's Altitude for the aſcertaining the Latitude, I cannot acquieſce to it; namely, adjuſting the Inſtrument by the Sun, Moon, or other heavenly Object. To adjuſt a Sextant thus for Obſervations relating to the Calculation of the Longitude, I have no Objection to; becauſe the Horizon in that Operation has the leaſt Buſineſs. But for taking a true Sun's Altitude, the Horizon is made as it were the fixed Point of meaſuring the Sun's Height by.

Now as it is evident to every Seaman, that the Horizon and remote Objects thereon will loom conſiderably at one Time more than another; that is, the Horizon will be elevated beyond its true Place, in Proportion as the Atmoſphere is denſe; nay even one Part of the Horizon will be ſometimes more ſo than another, which the Obſerver will plainly perceive if he carries his Inſtrument all round the Horizon in the Adjuſtment; this being the Caſe, I take it for granted, that the Sun will be affected in Proportion; and as the Atmoſphere is very changeable, it is obvious for theſe Reaſons, that no Object is ſo proper for adjuſting the Quadrant as the Horizon beneath the Sun; and that the Adjuſtment ſhould be always immediately before every Obſervation, more eſpecially for the Operation here treated of; namely aſcertaining the Latitude by two Altitudes; as ſuch Altitudes are taken either Forenoon or Afternoon, when the Atmoſphere is more denſe than on the Meridian of the Day.

I have been the more particular on this Head, well knowing many Seamen have been miſled by fine ſpun Theories of Land Navigators, which however has not had the leaſt Foundation on practical Utility at Sea.

What I have ſaid here, relates only to the Adjuſtment of the Quadrant for the fore Obſervation. The back Obſervation I ſhall ſay nothing to, except that it is very rarely wanted at Sea, particularly in this Work, for in the taking two Altitudes Forenoon or Afternoon, the whole Horizon almoſt may be uſed to obſerve from; and if the Operations for the back Obſervation ſhould be wanted, it cannot then be adjuſted when moſt neceſſary; but muſt be kept in Readineſs, and can be depended upon only as a make Shift, viz. rather to take an Altitude ſomewhat erroneous, than having no Altitude at all.

Of taking a correct Sun's Altitude.

WE now come to a Concluſion, and reduce our Theory to Practice. When you have adjuſted your Quadrant as before obſerved, the Index being acccurately fixed on the beginning of the Scale, and having brought the Horizon by Reflexion, and the Horizon by direct Viſion to correſpond accurately in one Line, then fix your Horizon Glaſs, all the while you have your Horizon in view; when this is done, unſcrew the Button on the back Part of your Index. If the Sun is bright, let down either or both of your Screens or dark Glaſſes as Occaſion requires; hold your Inſtrument virtically under the Sun; direct your View through the Vane, (the ſame Hole the Inſtrument was adjuſted with) obſerving the Horizon through the tranſparent Part of the Horizon Glaſs. Then move ſlowly the Index, till you catch the Sun in the great Speculum, and bring down its Image to the Horizon. When this is obtained, bring the lower Limb or Arch of the Sun to correſpond with the horizontal Line, touching each other nicely; moving your Body to the Right and Left, ſo as to make the Sun's Image ſweep the Horizontal Arch, obſerving the middle Point, where both your

Objects

Objects the Sun and Horizon coincide. Whilſt you determine this accurately, and with a ſteady Eye, ſecure your Index with the Screw on the Back of the Index before you let down your Quadrant; and this your apparent Altitude read of on the Nonius, as before mentioned. If your Altitude are intended for the Operation in this Book, be careful to take the exact Time by the Watch, the Inſtant you take down your Quadrant; after which you may read off your Altitude on the Nonius. But if you read off your Altitude firſt, a Minute or two may perchance elapſe, and make your Work erroneous.

Having obtained your apparent Altitude, correct it by the following Table of Refraction and Dip of the Horizon, as alſo the Sun's Semi-diameter; and this will give you your true Altitude.

A TABLE of REFRACTION to be ſubtracted from the apparent Altitude, or added to the Zenith Diſtance.

Altitude		Refract.		Alt.	Refrac.		Alt.	Refrac.		Alt.	Refrac.		Height above the Surface of the Water	Diſtance of the Horizon.
D	M	M	S	D	M	S	D	M	S	D	M	S		
0	0	33	00	5	8	50	21	2	7	37	1	5		
0	5	31	15	6	7	25	22	2	1	38	1	2	1	1
0	10	30	20	7	6	25	23	1	55	39	1	00	3	2
0	15	29	00	8	5	35	24	1	50	40	0	58	6	3
0	30	26	38	9	5	5	25	1	45	41	0	56	9	3½
0	45	24	15	10	4	30	26	1	40	42	0	54	12	4
1	0	23	30	11	4	5	27	1	36	43	0	52	18	5
1	15	21	15	12	3	45	28	1	31	44	0	50	24	6
1	30	20	15	13	3	30	29	1	27	45	0	48	30	6½
1	45	18	45	14	3	15	30	1	23	46	0	45	36	7
2	0	17	26	15	3	00	31	1	20	47	0	42	40	7¼
2	30	15	15	16	2	48	32	1	17	48	0	39	42	7½
3	0	13	23	17	2	40	33	1	14	49	0	36	45	8
3	30	11	53	18	2	30	34	1	11	50	0	34	48	8¼
4	0	10	40	19	2	20	35	1	9	51	0	32	49	8¾
4	30	9	40	20	2	12	36	1	7	52	0	30	50	9

EXAMPLE.

Admit being 25 Feet above the Surface of the Water, and my apparent Altitude to be 34 [illegible] 7 Minutes.

Refraction		1	
	34	6	
Dip —		6	
	34	00	
Sun's Semi-diameter		16	
	34	16	true Altitude,

I ſhall not here proceed further, as every Seaman muſt be acquainted with the Work of determining the Latitude by a Meridian Obſervation; my Deſign in this Appendix being only to inſtruct the Seaman in the Principles and practical Uſe of that noble Inſtrument and thereby to obtain a correct Altitude, in order to enable him the more of benefitting by the uſeful Tables here delivered. I therefore now take my Leave, with my beſt Wiſhes, that what I have delivered, may give the fulleſt Satisfaction, and prove happily ſucceſsful in the Application.

FINIS.

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